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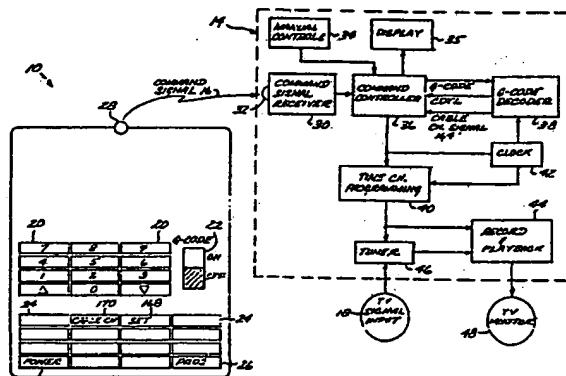
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/US89/05806</p> <p>(22) International Filing Date: 16 December 1989 (16.12.89)</p> <p>(30) Priority data: 289,369 23 December 1988 (23.12.88) US 371,054 26 June 1989 (26.06.89) US</p> <p>(60) Parent Applications or Grants (63) Related by Continuation US 289,369 (CIP) Filed on 23 December 1988 (23.12.88) US 371,054 (CIP) Filed on 26 June 1989 (26.06.89)</p> <p>(71)(72) Applicants and Inventors: YUEN, Henry, C. [US/US]; 725 Lakewood Place, Pasadena, CA 91106 (US). KWOH, Daniel, S. [US/US]; 5029 Fox Point Lane, Rolling Hills Estates, CA 91106 (US).</p>		<p>(74) Agent: TOWER, Lee, W.; 19 Saddle Road, Rancho Palos Verdes, CA 90274 (US).</p> <p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>	
<p>(54) Title: APPARATUS AND METHOD FOR USING ENCODED VIDEO RECORDER/PLAYER TIMER PREPROGRAMMING INFORMATION</p> <p>(57) Abstract</p> <p>Encoded video recorder/player timer preprogramming information (212) listed in a television guide (200) allows a timer preprogramming feature on a video cassette-recorder (VCR) (14) to be programmed using a compressed code (102, 158, 212) of only 1 to as few as 7 digits, which are decoded by a decoder (38) built into either the video cassette recorder or a remote controller (82) to convert the compressed code into channel, date, time and length (118, 142) information. The channel, date, time and length information is communicated to a VCR and used to automatically activate the VCR to record a given television program with the corresponding channel, date, time and length. Alternately, the channel, date, time and length information is decoded directly in a remote controller (80) and only start record, stop record and channel selection commands are sent to the VCR (70) at the appropriate times. The compressed codes (212) associated with each television program can be printed in a television program guide (200) in advance and used with a VCR or remote controller with the decoding means. The compressed codes for timer preprogramming can be utilized for just one program or repeatedly for daily or weekly use. The algorithm (100) for decoding the compressed codes can be a function of time (120, 42, 122) to ensure security of the decoding method. A method is included for use of the compressed codes with cable channels (176, 160, 162, 166) and a method and apparatus is described for timer preprogramming for a large number of programs (76). The coding technique can also be used for compressed coding of any multidimensional vector for commercial or industrial applications.</p>			



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APPARATUS AND METHOD FOR USING ENCODED VIDEO  
RECORDER/PLAYER TIMER PREPROGRAMMING INFORMATION

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BACKGROUND OF THE INVENTION

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1. Field of the Invention

This invention relates generally to video cassette recorder systems and particularly to the timer preprogramming feature of video cassette recorders (VCRs) and to an apparatus and method for using encoded information to shorten the time required to perform timer preprogramming.

20 2. Prior Art

The video cassette recorder (VCR) has a number of uses, including playing back of tapes filmed by a video camera, playing back of pre-recorded tapes, and recording and playing back of broadcast and cable television programs.

To record a television program in advance of viewing it, a two-step process is often used: (1) obtain the correct channel, date, time and length (CDTL) information from a television program guide, and (2) program this CDTL information into the VCR. Depending on the model, year and type of the VCR, the CDTL information can be programmed in various ways including: (i)

pushing an appropriate sequence of keys in the console according to instructions contained in the user's manual, (ii) pushing an appropriate sequence of keys in a remote hand-held control unit according to instructions contained in the user's manual (remote 5 programming), and (iii) executing a series of keystrokes in the remote hand-held control unit in response to a menu displayed on the television screen (on-screen programming). Other techniques for timer preprogramming have been suggested including: (iv) reading in certain bar-code information using a light pen (light 10 pen programming), and (v) entering instructions through a computer or telephone modem. These various methods differ only in the physical means of specifying the information while the contents, being CDTL and certain power/clock/timer on-off commands are generally common although the detailed protocol can 15 vary with different model VCRs. Methods (i) and (ii) described above can require up to 100 keystrokes, which has inhibited the free use of the timer preprogramming feature of VCRs. To alleviate this, new VCR models have included an "On-Screen Programming" feature, which permits remote input of CDTL 20 information in response to a menu displayed on the television screen. Generally on screen programming of CDTL information requires an average of about 18 keystrokes, which is less than some of the prior methods but still rather substantial. Some of the other techniques such as (iv) above, require the use of 25 special equipment such as a bar code reader.

In general the present state of the art suffers from a number of drawbacks. First, the procedure for setting the VCR to record in advance can be quite complex and confusing and difficult to learn; in fact, because of this many VCR owners shun 30 using the timer preprogramming record feature. Second, the transcription of the CDTL information to the VCR is hardly ever error-free; in fact, many users of VCR's timer preprogramming features express concern over the high incidence of programming

errors. Third, even for experienced users, the process of entering a lengthy sequence of information on the channel, date, time and length of desired program can become tedious. Fourth, techniques such as reading in bar-code information or using a computer require special equipment. These drawbacks have created a serious impedance in the use of a VCR as a recording device for television programs. The effect is that time shifting of programs has not become as popular as it once was thought it would be. Accordingly, there is a need in the art for a simpler system for effecting VCR timer preprogramming which will enable a user to take advantage of the recording feature of a VCR more fully and freely.

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SUMMARY OF THE INVENTION

A principal object of the invention is to provide an improved system for the selection and entering of channel, date, time and length (CDTL) information by a user required for timer preprogramming of a VCR which is substantially simpler, faster and less error-prone than present techniques.

In accordance with the invention, to program the timer preprogramming feature of a video system, there is an apparatus and method for using encoded video recorder/player timer preprogramming information. The purpose is to significantly reduce the number of keystrokes required to set up the timer preprogramming feature on a VCR. In accordance with this invention it is only necessary for the user to enter a code with 25 1 to 7 digits or more into the VCR. This can be done either 30 remotely or locally at the VCR. Built into either the remote controller or the VCR is a decoding means which automatically converts the code into the proper CDTL programming information and activates the VCR to record a given television program with

the corresponding channel, date, time and length. Generally multiple codes can be entered at one time for multiple program selections. The code can be printed in a television program guide in advance and selected for use with a VCR or remote controller with the decoding means.

Other objects and many of the attendant features of this invention will be more readily appreciated as the same becomes better understood by reference to the following detailed 10 descriptions and considered in connection with the accompanying drawings in which like reference symbols designate like parts throughout the figures.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic showing apparatus according to this invention with the code decoder means embedded in the video cassette recorder.

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FIG. 2 is a schematic of the VCR embedded processors for command control and code decoding.

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FIG. 3 is a schematic showing apparatus according to this invention with the code decoder means embedded in a remote controller.

FIG. 4 is a schematic of the processor embedded in the remote controller.

30

FIG. 5 is a schematic of a universal remote controller with the code decoder means embedded in the universal remote controller.

FIG. 6 is a flow graph of the G-code decoding technique.

FIG. 7 is a flow graph of the G-code encoding technique.

5 FIG. 8 is an illustration of part of a television calendar according to this invention.

FIG. 9 is a flowchart for decoding for cable channels.

10 FIG. 10 is a flowchart for encoding for cable channels.

FIG. 11. is a flow graph of the G-code decoding for cable channels including conversion from assigned cable channel number to local cable carrier channel number.

15 FIG. 12 is a means for decoding including a stack memory.

FIG. 13 is a flowchart for program entry into stack memory.

20 FIG. 14 is a operation flowchart for sending programs from remote control to main unit VCR.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 Referring now to the drawings, and more particularly, to FIG. 1, there is shown an apparatus for using encoded video recorder/player timer preprogramming information 10 according to this invention. The primary components include a remote controller 12 and a video cassette recorder/player with G-code decoder 14, which can be controlled by remote controller 12 via a command signal 16. The remote controller 12 can have a number of keys, which include numerical keys 20, G-code switch 22, function keys 24, program key 26 and power key 27. There are means in the

remote controller 12 that interpret each key as it is pressed and send the proper command signal 16 to the VCR via an infra-red light emitting diode 28. Except for the G-code switch 22 on the remote controller 12 in FIG. 1, the remote controller 12 is 5 essentially the same as any other remote controller in function. The G-code switch 22 is provided just to allow the user to lock the remote controller 12 in the G-code mode while using a G-code, which is the name given to the compressed code which is the encoded CDTL information, to perform timer preprogramming.

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A G-code consists of 1 to 7 digits, although more could be used, and is associated with a particular program. A user would lookup the G-code in a program guide and just enter the G-code on the remote controller 12, instead of the present state of the 15 art, which requires that the user enter the actual channel, date, time and length (CDTL) commands.

In order to understand the advantages of using a G-code, it is helpful to describe the best of the current state of the art, 20 which is "on screen programming" with direct numeral entry. This technique involves about 18 keystrokes and the user has to keep switching his view back and forth between the TV screen and the remote controller while entering the CDTL information. This situation may be akin to a user having to dial an 18 digit 25 telephone number while reading it from a phone book. The number of keys involved and the switching back and forth of the eye tend to induce errors. A typical keying sequence for timer recording using on-screen CDTL programming is as follows:

30

PROG 2 1 15 07 30 2 08 00 2 04 PROG

The first program (PROG) key 26 enters the programming mode. Then a sequence of numericals key 20 are pushed. The 2 means it is timer recording rather than time setting. The 1 means the

user is now entering the settings for program 1. The 15 is the date. The 07 is starting hour. The 30 is a starting minute. The 2 means pm. The next sequence 08 00 2 is the stopping time. The 04 is channel number. Finally, the PROG is hit again to exit the program mode.

By contrast, this command could have been "coded" and entered in a typical G-code sequence as follows: PROG 1138 PROG. To distinguish that the command is a coded G-code, the G-code switch 22 should be turned to the "ON" position. Instead of having a switch, a separate key "G" can be used. The G-code programming keystroke sequence would then be: G 1138 PROG.

The use of a G-code does not preclude "on-screen" confirmation of the program information that has been entered. When the keystrokes "PROG 1138 PROG" are entered with the G-code switch in the "ON" position, the G-code would be decoded and the television could display the following message:

20	PROGRAM	DATE	START TIME	STOP TIME	CHANNEL
	1138	15	7:30 PM	8:00 PM	4

In order for the G-code to be useful it must be decoded and apparatus for that purpose must be provided. Referring to FIG. 1, a video cassette recorder/player with G-code decoder 14 is provided to be used in conjunction with remote controller 12. The command signal 16 sent from the remote controller 12 is sensed by the photodiode 32 and converted to electrical signals by command signal receiver 30. The electrical signals are sent to a command controller 36, which interprets the commands and determines how to respond to the commands. As shown in FIG. 1, it is also possible for the command controller 36 to receive commands from the manual controls 34 that are normally built into

a VCR. Other possible command sources include voice if a speech recognizer is incorporated into the VCR and a bar code scanner. If the command controller 36 determines that a G-code was received then the G-code will be sent to the G-code decoder 38 for decoding. The G-code decoder 38 converts the G-code into CDTL information, which is used by the command controller 36 to set the time/channel programming 40. Built into the VCR is a clock 42. This is normally provided in a VCR and is used to keep track of the date and time. The clock 42 is used primarily by the time/channel programming 40 and the G-code decoder 38 functions. The time/channel programming 40 function is set up with CDTL information by the command controller 36. When the proper date and time is read from clock 42, then the time/channel programming 40 function turns the record/playback 44 function on to record. At the same time the tuner 46 is tuned to the proper channel in the television signal 18.

An alternate way to control the recorder is to have the command controller 36 keep all the CDTL information instead of sending it to the time/channel programming 40. The command controller would also keep track of the time by periodically reading clock 42. The command controller would then send commands to the time/channel programming 40 to turn on and off the recorder and to tuner 46 to cause it to tune to the right channel at the right time according to the CDTL information.

The clock 42 is also an input to G-code decoder 38, which allows the G-code decoding to be a function of the clock, which lends a measure of security to the decoding technique and makes it harder to copy. Of course this requires that the encoding technique must also be a function of the clock.

A possible realization of the command controller 36 and the G-code decoder 38 is shown in FIG. 2. The command controller 36

function can be realized with a microprocessor 50, a random access memory 52 and a read only memory 54, which is used for program storage. The input/output 56 function is adapted to receive commands from the command signal receiver 30, the manual controls 34 and the clock 42, and to output signals to a display 35, the clock 42, and the time/channel programming 40 function. If the microprocessor 50 interprets that a G-code has been received, then the G-code is sent to microcontroller 60 for decoding. The microcontroller 60 has an embedded random access memory 62 and an embedded read only memory 64 for program and table storage. The clock 42 can be read by both microprocessor 50 and microcontroller 60.

An alternative to having microcontroller 60 perform the G-code decoding is to build the G-code decoding directly into the program stored in read only memory 54. This would eliminate the need for microcontroller 60. Of course, other hardware to perform the G-code decoding can also be used. The choice of which implementation to use is primarily an economic one.

The blocks in Figs. 1 and 2 are well known in the prior art and are present in the following patents: Fields, patent no. 4,481,412; Scholz, patent no. 4,519,003; and Brugliera, patent no. 4,631,601. For example, clock 42 is analogous to element 7 in Scholz and element 17 in Brugliera. Other analogous elements are: command signal receiver 30 and Scholz 14 and Brugliera 12; tuner 46 and Scholz 6 and Brugliera 10; time/channel programming 40 and Scholz 8, 11 and Brugliera 16; record & playback 44 and Scholz 1, 2, 4; command controller 36 and Scholz 11, 10 and Brugliera 12; microprocessor 50 and Fields 27; RAM 62 and Fields 34; ROM 54 and Fields 33; manual controls 34 and Scholz 15, 16; and remote controller 12 and Scholz 26 and Brugliera 18.

FIG. 3 illustrates an alternate preferred embodiment of this invention. In FIG. 3 a remote controller with embedded G-code decoder 80 is provided. The remote controller with embedded G-code decoder 80 is very similar to remote controller 12, except for the addition of the G-code decoder 82. Note that it is also possible in any remote controller to provide a display 84. The remote controller with embedded G-code decoder 80 would be used in conjunction with a normal video cassette recorder/player 70, which would not be required to have an embedded G-code decoder.

10 The numerals for the subelements of video cassette recorder/player 70 are the same as described above for the video cassette recorder/player with G-code decoder 14 and have the same function, except for the absence of G-code decoder 38. This preferred embodiment has the advantage that it can be used in conjunction with VCRs that are presently being used. These do not have a G-code decoding capability. Replacing their remote controllers with ones that have this capability built-in can vastly improve the capability to do timer preprogramming for a modest cost.

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FIG. 4 illustrates a possible realization of the G-code decoder 82 built into the remote controller with embedded G-code decoder 80. A microprocessor 60 can be used as before to decode the G-code, as well as interface with the display 84, a clock 85, the keypad 88 and the light emitting diode 28. Alternately, other hardware implementations can be used to perform the G-code decoding. The clock is provided in the remote controller 80 so that the G-code decoder 82 can be made to have the clock as one of its inputs. This allows the G-code decoding to be a function of the clock, which lends a measure of security to the decoding technique and makes it harder to copy.

The remote controller with embedded G-code decoder as described above would send channel, date, time and length

information to the video cassette recorder/player 70, which would use the CDTL information for tuning into the correct channel and starting and stopping the recording function. The remote controller may have to be unique for each different video cassette recorder/player, because each brand or model may have different infrared pulses for each type of information sent such as the channel number keys and start record and stop record keys. The particular infrared pulses used for each key type can be called the vocabulary of the particular remote controller. Each model may also have a different protocol or order of keys that need to be pushed to accomplish a function such as timer preprogramming. The protocol or order of keys to accomplish a function can be called sentence structure. If there is a unique remote controller built for each model type, then the proper vocabulary and sentence structure can be built directly into the remote controller.

An alternate to having the remote controller with embedded G-code decoder send channel, date, time and length information to the video cassette recorder/player 70, is to have the remote controller with embedded G-code decoder perform more operations to simplify the interfacing problem with existing video cassette recorder/players. In particular, if the remote controller not only performs the G-code decoding to CDTL, but also keeps track of time via clock 85, then it is possible for the remote controller to send just channel, start record and stop commands to the video cassette recorder/player. These are usually basic one key commands, which means there is no complicated protocol or sentence structure involved. Thus, to communicate with a diverse set of video cassette recorder/player models it is only necessary to have memory within the remote controller, such as ROM 64 of FIG. 4, for storing the vocabulary for all the models or at least a large subset. The G-code would be entered on the remote controller as before and decoded into channel, date, time and

length information, which would be stored in the remote controller. Via clock 85, the time would be checked and when the correct time arrives the remote controller would automatically send out commands to the VCR unit for tuning to the correct 5 channel and for starting and stopping the recording. It is estimated that only two (2) bytes per key for about 15 keys need to be stored for the vocabulary for each video cassette recorder/player model. Thus, to cover 50 models would only require about  $30*50 = 1500$  bytes of memory in the remote 10 controller. It would be necessary to position the remote controller properly with respect to the VCR unit so that the sent infrared signals sent by the remote controller are received by the unit.

15 Another preferred embodiment is to provide a universal remote controller 90 with an embedded G-code decoder. Universal remote controllers provide the capability to mimic a number of different remote controllers. This reduces the number of remote controllers that a user needs to have. This is accomplished by 20 having a learn function key 94 function on the universal remote controller, as shown in FIG. 5. If the learn function key 94 is pushed in conjunction with another key, the unit will enter into the learn mode. Incoming infra-red (IR) pulses from the remote controller to be learned are detected by the infra-red photodiode 25 96, filtered and wave-shaped into recognizable bit patterns before being recorded by a microcontroller into a battery-backed static RAM as the particular IR pulse pattern for that particular key. This is done for all the individual keys.

30 An example of more complex learning is the following. If the learn function key 94 in conjunction with the program key 26 are pushed when the G-code switch is "ON", the unit will recognize that it is about to record the keying sequence of a predetermined specific example of timer preprogramming of the

particular VCR involved. The user will then enter the keying sequence from which the universal remote controller 90 can then deduce and record the protocol of the timer preprogramming sequence. This is necessary because different VCRs may have 5 different timer preprogramming command formats.

If keys are pushed without the learn function key 94 involved, the microcontroller should recognize it is now in the execute mode. If the key is one of the direct command keys, the 10 microcontroller will read back from its static RAM the stored pulse sequence and send out command words through the output parallel I/O to pulse the output light emitting diode 28. If the key is the PROG key and the G-code switch is "OFF", then the microcontroller should recognize the following keys up to the 15 next PROG key as a timer preprogramming CDTL command and send it out through the light emitting diode 28. If the G-code switch 22 is set to "ON" and the program key 26 is pushed, the microcontroller should recognize the following keys up to the next PROG key as a G-code command for timer preprogramming. It 20 will decode the G-code into channel, date, start time and length (CDTL) and the microcontroller will then look up in it's static RAM "dictionary" the associated infra-red pulse patterns and concatenate them together before sending them off through the output parallel I/O to pulse the light emitting diode 28 to send 25 the whole message in one continuous stream to the VCR.

FIG. 4 illustrates a possible realization of the G-code decoder 92 that could be built into the universal remote controller with embedded G-code decoder 90. A microcontroller 60 can be used as before to decode the G-code, as well as for 30 interfacing with the input/output functions including the photodiode 96. Alternately, the G-code decoding can be performed with other hardware implementations.

The universal remote controller can also be used in another manner to simplify the interfacing problem with existing video cassette recorder/players. In particular, if the universal remote controller performs not only the G-code decoding to CDTL, 5 but also keeps track of time via clock 85 in FIG. 4, then it is possible for the universal remote controller to send just channel, start record and stop commands to the video cassette recorder/player, which as explained before, are usually basic one key commands, which means there is no complicated protocol or 10 sentence structure involved. Thus, to communicate with a diverse set of video cassette recorder/player models it is only necessary for the universal remote controller to "learn" each key of the remote controller it is replacing. The G-code would be entered 15 on the universal remote controller as before and decoded into channel, date, time and length information, which would be stored in the universal remote controller. Via clock 85, the time would be checked and when the correct time arrives the universal remote controller would automatically send out commands to the VCR unit for tuning to the correct channel and for starting and stopping 20 the recording. It would be necessary to position the universal remote controller properly with respect to the VCR unit so that the signals sent by the universal remote are received by the VCR unit.

25 There are a number of ways that the G-code decoding can be performed. The most obvious way is to just have a large look up table. The G-code would be the index. Unfortunately, this would be very inefficient and result in a very expensive decoder due to the memory involved. The total storage involved is a function of 30 the number of total combinations. If we allow for 128 channels, 31 days in a month, 48 on the hour and on the half hour start times in a twenty four hour day, and 16 length selections in half hour increments, then the total number of combinations is  $128 \times 31 \times 48 \times 16 = 3,047,424$ . This number of combinations can be

represented by a 7 digit number. The address to the table would be the 7 digit number. In the worse case, this requires a lookup table that has about 4,000,000 rows by 15 to 16 digital columns, depending on the particular protocol. These digital columns 5 would correspond to the CDTL information required for "on screen programming". Each digit could be represented by a 4 bit binary number. Thus, the total storage number of bits required for the lookup table would be about  $4,000,000 \times 16 \times 4 = 256,000,000$ . The present state of the art has about 1 million bits per chip. 10 Thus, G-code decoding using a straightforward table lookup would require a prohibitively expensive number of chips.

Fortunately, there are much more clever ways of performing the G-code decoding. FIG. 6 is a flow diagram of the preferred 15 G-code decoding technique. To understand G-code decoding, it is easiest to first explain the G-code encoding technique, for which FIG. 7 is the flow chart. Then the G-code decoding technique, which is the reverse of the G-code encoding will be explained.

20 The encoding of the G-codes can be done on any computer and is done prior to preparation of any program guide that would include G-codes. For each program that will be printed in the guide, a channel, date, time and length (CDTL) code 144 is entered in step 142. Step 146 separately reads the priority for 25 the channel, date, time and length in the priority vector storage 122, which can be stored in read only memory 64. The priority vector storage 122 contains four tables: a priority vector C table 124, a priority vector D table 126, a priority vector T table 128 and a priority vector L table 130.

30 The channel priority table is ordered so that the most frequently used channels have a low priority number. An example of the data that is in priority vector C table 124 follows.

16.

channel	4	7	2	3	5	6	11	13	...
priority	0	1	2	3	4	5	6	7	...

Generally the dates of a month all have an equal priority,  
 5 so the low number days in a month and the low number priorities  
 would correspond in the priority vector D table as in the  
 following example.

date	1	2	3	4	5	6	7	8	9	10	..
priority	0	1	2	3	4	5	6	7	8	9	..

The priority of the start times would be arranged so that  
 prime time would have a low priority number and programs in the  
 dead of the night would have a high priority number. For  
 15 example, the priority vector T table would contain:

time	6:30pm	7:00pm	8:00pm	7:30pm	...
priority	0	1	2	3	...

20 An example of the data that is in the priority vector L  
 table 130 is the following:

length of program (hours)	0.5	1.0	2.0	1.5	3.0	...
priority	0	1	2	3	4	...

25 Suppose the channel date time length (CDTL) 144 data is 5 10  
 19.00 1.5, which means channel 5, 10th day of the month, 7:00 PM,  
 and 1.5 hours in length, then the  $C_p, D_p, T_p, L_p$  data 148 for the  
 above example would be 4 9 1 3. Step 150 converts  $C_p, D_p, T_p, L_p$   
 30 data to binary numbers. The number of binary bits in each  
 conversion is determined by the number of combinations involved.  
 Seven bits for  $C_p$ , which can be denoted as  $C_7 C_6 C_5 C_4 C_3 C_2 C_1$ ,  
 would provide for 128 channels. Five bits for  $D_p$ , which can be  
 denoted as  $D_5 D_4 D_3 D_2 D_1$ , would provide for 31 days in a month.

5 Six bits for  $T_p$ , which can be denoted as  $T_6 T_5 T_4 T_3 T_2 T_1$ , would provide for 48 start times on each half hour of a twenty four hour day. Four bits for length, which can be denoted as  $L_4 L_3 L_2 L_1$ , would provide for a program length of up to 8 hours in half hour steps. Together there are  $7+5+6+4 = 22$  bits of information, which correspond to  $2^{**22} = 4,194,304$  combinations.

10 The next step is to use bit hierarchy key 120, which can be stored in read only memory 64 to reorder the 22 bits. The bit hierarchy key 120 can be any ordering of the 22 bits. For example, the bit hierarchy key might be:

15  $L_8 C_3 \dots T_2 C_2 T_1 C_1 L_1 D_5 D_4 D_3 D_2 D_1$   
22 21 ... 10 9 8 7 6 5 4 3 2 1

20 Ideally the bit hierarchy key is ordered so that programs most likely to be the subject of timer preprogramming would have a low value binary number, which would eliminate keystrokes for timer preprogramming the most popular programs. Since all the date information has equal priority, then the  $D_5 D_4 D_3 D_2 D_1$  bits are first. Next  $T_1 C_1 L_1$  are used, because for whatever date it is necessary to have a time channel and length and  $T_1 C_1 L_1$  are the most probable in each case due to the ordering of the priority vectors in priority vector storage 122. The next bit in 25 the hierarchy key is determined by the differential probabilities of the various combinations. One must know the probabilities of all the channels, times and lengths for this calculation to be performed.

30 For example, the probability for channels may be:

channel	4	7	2	3	5	6	11	13	...
priority	0	1	2	3	4	5	6	7	...

18

probability(%)	5	4.3	4	3	2.9	2.1	2	1.8	...
----------------	---	-----	---	---	-----	-----	---	-----	-----

The probabilities for times might be:

5	time	6:30pm	7:00pm	8:00pm	7:30pm	...
	priority	0	1	2	3	...
	probability(%)	8	7.8	6	5	...

And, the probabilities for lengths might be:

10	length of program (hours)	0.5	1.0	2.0	1.5	3.0	...
	priority	0	1	2	3	4	...
	probability(%)	50	20	15	5	4	...

15 The probabilities associated with each channel, time and length, as illustrated above, are used to determine the proper ordering. Since the priority vector tables are already ordered by the most popular channel, time, and length, the order in which to select between the various binary bits for one table, for 20 example selecting between the  $C_7$   $C_6$   $C_5$   $C_4$   $C_3$   $C_2$   $C_1$  bits, is already known. The  $C_1$  bit would be selected first because as the lowest order binary bit it would select between the first two entries in the channel priority table. Then the  $C_2$  bit would be selected and so on. Similarly, the  $T_1$  and  $L_1$  bits would be used 25 before any of the other time and length bits. A combination of the  $C_1$ ,  $T_1$ ,  $L_1$  and  $D_5$   $D_4$   $D_3$   $D_2$   $D_1$  bits should be used first, so that all the information is available for a channel, date, time and length. The  $D_5$   $D_4$   $D_3$   $D_2$   $D_1$  bits are all used because the date bits all have equal priority and all are needed to specify a 30 date even if some of the bits are binary zero.

At this point the bit hierarchy key could be:

$T_1$   $C_1$   $L_1$   $D_5$   $D_4$   $D_3$   $D_2$   $D_1$

5 The first channel binary bit  $C_1$  by itself can only select between  $2^1 = 2$  channels, and the first two channels have a probability percent of 5 and 4.3, respectively. So the differential probability of  $C_1$  is 9.3. Similarly, the differential probability of  $T_1$  is  $8 + 7.8 = 15.8$ , and the differential probability of  $L_1$  is  $50 + 20 = 70$ . If the rules for ordering the bit hierarchy key are strictly followed, then the first 8 bits of the bit hierarchy key should be ordered as:

10

$C_1 \ T_1 \ L_1 \ D_5 \ D_4 \ D_3 \ D_2 \ D_1$ ,

15 because  $L_1$  has the highest differential priority so it should be first, followed by  $T_1$ , and then  $C_1$ .

15

20 The question at that point is what should the next bit in the hierarchy key be:  $T_2$ ,  $C_2$ , or  $L_2$ . This is determined by the differential probabilities, which can be calculated from the above tables for each bit. Since we are dealing with binary bits, the  $C_2$  in combination with  $C_1$  selects between  $2^2 = 4$  channels or 2 more channels over  $C_1$  alone. The differential probability for  $C_2$  is then the additional probabilities of these two additional channels and for the example this is:  $4 + 3 = 7$ . In a similar manner  $C_3$  in combination with  $C_1$  and  $C_2$  selects 25 between  $2^3 = 8$  channels or  $4 = 2^{(3-1)}$  more channels over the combination of  $C_1$  and  $C_2$ . So the differential probability of  $C_3$  is the additional probabilities of these four additional channels and for the example this is:  $2.9 + 2.1 + 2 + 1.8 = 8.8$ . In a similar manner, the differential probabilities of  $T_2$  and  $L_2$  can 30 be calculated to be  $6 + 5 = 11$  and  $15 + 5 = 20$ , respectively. Once all the differential probabilities are calculated, the next step is determining which combinations of bits are more probable.

Now for the above example, which combination is more probable:  $T_2$  with  $C_1 L_1$ , or  $C_2$  with  $T_1 L_1$ , or  $L_2$  with  $T_1 C_1$ . This will determine the next bit in the key. So, which is greater:  $11 \times 9.3 \times 70 = 7161$ ;  $7 \times 15.8 \times 70 = 7742$ ; or  $20 \times 15.8 \times 9.3 = 2938.8$ ? In this case the combination with the greatest probability is  $7 \times 15.8 \times 70 = 7742$ , which corresponds to  $C_2$  with  $T_1 L_1$ . So,  $C_2$  is selected as the next bit in the bit hierarchy key.

The next bit is selected in the same way. Which combination is more probable:  $C_3$  with  $T_1 L_1$ , or  $T_2$  with  $C_1$  or  $C_2$  and  $L_1$ , or  $L_2$  with  $C_1$  or  $C_2$  and  $T_1$ . For the example shown, which has the greatest probability:  $8.8 \times 15.8 \times 70 = 9732.8$ ;  $11 \times (9.3+7) \times 70 = 12551$ ; or  $20 \times (9.3+7) \times 15.8 = 5150.8$ ? In this case the combination with the greatest probability is  $11 \times (9.3+7) \times 70 = 12551$ , which corresponds  $T_2$  with  $C_1$  or  $C_2$  and  $L_1$ . So,  $T_2$  is selected as the next bit in the bit hierarchy key. This procedure is repeated for all the differential probabilities until the entire key is found.

Alternately, the bit hierarchy key can be just some arbitrary sequence of the bits. It is also possible to make the priority vectors interdependent, such as making the length priority vector dependent on different groups of channels. Another technique is to make the bit hierarchy key 120 and the priority vector tables 122, a function of clock 42, as shown in FIG. 7. This makes it very difficult for the key and therefore the coding technique to be duplicated or copied.

For example it is possible to scramble the date bits in the bit hierarchy key 120 as a function of the clock. This would not change the effectiveness of the bit hierarchy key in reducing the number of binary bits for the most popular programs, because the date bits all are of equal priority. This could be as simple as

21

switching the  $D_1$  and  $D_5$  bits periodically, such as every day or week. Thus the bit hierarchy key 120 would switch between

...  $C_1 T_1 L_1 D_5 D_4 D_3 D_2 D_1$  and

5

...  $C_1 T_1 L_1 D_1 D_4 D_3 D_2 D_5$ .

Clearly other permutations of the bit hierarchy key as a function of the clock are possible.

10

The priority vector tables could also be scrambled as a function of the clock. For example, the first two channels in the priority channel table could just be swapped periodically. If this technique is followed, then the  $C_p$  of 148 in FIG. 7 would change as a function of the clock 42. For example,

channel	4	7	2	3	5	6	11	13	...
priority	0	1	2	3	4	5	6	7	...

20 would change periodically to:

channel	7	4	2	3	5	6	11	13	...
priority	0	1	2	3	4	5	6	7	...

25 This would be a fairly subtle security technique, because a decoder that was otherwise correct would only fail if those first two channels were being used. Other clock dependencies are also possible to provide security for the coding technique.

30 However it is derived, the bit hierarchy key 120 is determined and stored. In step 154 the binary bits of  $C_p, D_p, T_p, L_p$  are rearranged according to the bit hierarchy key 120 to create one 22 bit binary number. Then the resulting 22 bit

binary number is converted to decimal in the convert binary number to decimal G-code step 156. The result is G-code 158.

5 If the priority vector and the bit hierarchy key are well matched to the viewing habits of the general population, then it is expected that the more popular programs would require no more than 3 or 4 digits for the G-code.

10 Now that the encoding technique has been explained the decoding technique is just reversing the coding technique. This is done according to the flow chart of FIG. 6. This is the preferred G-code decoding that can be built into G-code decoder 38 in VCR 14 or the remote controller G-code decoders 82 and 92 in FIGs. 3 and 5.

15

The first step 102 is to enter G-code 104. Next the G-code 104 is converted to a 22 bit binary number in step 106. Then the bits are reordered in step 108 according to the bit hierarchy key 120 to obtain the reordered bits 110. Then the bits are grouped together and converted to decimal form in step 112. As this point we obtain  $C_p, D_p, T_p, L_p$  data 114, which are the indices to the priority vector tables. For the above example, we would have at this step the vector 4 9 1 3. This  $C_p, D_p, T_p, L_p$  data 114 is then used in step 116 to lookup channel, date, time, and length 20 in priority vector storage 122. The CDTL 118 for the example 25 above is 5 10 19.00 1.5, which means channel 5, 10th day of the month, 7:00 PM, and 1.5 hours in length.

30 If the coding technique is a function of the clock then it is also necessary to make the decoding technique a function of the clock. It is possible to make the bit hierarchy key 120 and the priority vector tables 122, a function of clock 42, as shown in FIG. 6. This again makes it very difficult for the key and therefore the coding technique to be duplicated or copied. It is

also possible to have the decoding and encoding techniques dependent on any other predetermined or preprogrammable algorithm.

5        Although the above G-code encoding and decoding technique is a preferred embodiment, it should be understood that there are many ways to perform the intent of the invention which is to reduce the number of keystrokes required for timer preprogramming. To accomplish this goal there are many ways to  
10      perform the G-code encoding and decoding. There are also many ways to make the encoding and decoding technique more secure besides just making the encoding and decoding a function of the clock. This security can be the result of any predetermined or preprogrammed algorithm.

15      It is possible in the G-code coding and decoding techniques to use mixed radix number systems instead of binary numbers. For example, suppose that there are only 35 channels, which would require 6 binary bits to be represented; however, 6 binary bits  
20      can represent 64 channels, because  $2^6 = 64$ . The result is that in a binary number system there are 29 unnecessary positions. This can have the effect of possibly making a particular G-code longer than it really needs to be. A mixed radix number system can avoid this result. For example, for the case of 35 channels,  
25      a mixed radix number system with the factors of  $7^1$  and  $5^0$  can represent 35 combinations without any empty space in the code. The allowed numbers for the  $7^1$  factor are 0, 1, 2, 3, and 4. The allowed numbers for the  $5^0$  factor are 0, 1, 2, 3, 4, 5, and 6. For example, digital 0 is represented in the mixed radix number  
30      system as 00. The digital number 34 is represented in the mixed radix number system as 46, because  $4*7^1+6*5^0 = 34$ . The major advantage of a mixed radix number system is in prioritizing the hierarchy key. If the first 5 channels have about equal priority and the next 30 are also about equal, then the mixed radix number

system allows the two tiers to be accurately represented. This is not to say that a mixed radix number system is necessarily preferable. Binary numbers are easier to represent in a computer and use of a fixed radix number system such as binary numbers 5 allows a pyramid of prioritization to be easily represented in the hierarchy key.

Another feature that is desirable in all of the embodiments is the capability to key in the G-code once for a program and 10 then have the resulting CDTL information used daily or weekly. Ordinarily the CDTL information is discarded once it is used. In the case of daily or weekly recording of the same program, the CDTL information is stored and used until it is cancelled. The desire to repeat the program daily or weekly can be performed by 15 having a "WEEKLY" or "DAILY" button on the remote controller or built into the VCR manual controls. Another way is to use one key, such as the PROG key and push it multiple times within a certain period of time such as twice to specify daily or thrice to specify weekly. For example, if the G-code switch is "ON" and 20 the G-code for the desired program is 99 then daily recording of the program can be selected by the following keystrokes:

"PROG 99 DAILY PROG"

or by:

"PROG 99 PROG P ROG".

25 The G-code 99 would be converted to CDTL information, which would be stored and used daily in this case. The recording would begin on the date specified and continue daily after that using the same channel time and length information. A slight twist is that daily recording could be automatically suspended during the 30 weekends, because most daily programs are different on Saturday and Sunday.

Once a daily or weekly program is set up, then it can be used indefinitely. If it is desired to cancel a program and if

there is a "CANCEL" button on the remote controller or manual control for the VCR, then one way to cancel a program (whether it is a normal CDTL, daily or weekly entry) is to key in the following:

5 "PROG xx CANCEL", where xx is the G-code.

Again as before there are alternate ways of accomplishing this.

10 If "on screen programming" is available, then the programs that have been selected for timer preprogramming could be reviewed on the screen. The daily and weekly programs would have an indication of their type. Also the G-codes could be displayed along with the corresponding CDTL information. This would make it quite easy to review the current "menu" and either add more programs or cancel programs as desired.

15

20 A television calendar 200 according to this invention is illustrated in FIG. 8. As shown, the television calendar has multiple day of year sections 202, multiple day sections 204, multiple time of day sections 206, channel indications 208, and descriptive program indications 210 arranged in a manner that is common in television guide publications. Arranged in relation to each channel indication is a compressed code 212 or G-code containing the channel, date, time and length information for that entry in the television calendar. FIG. 8 shows how easy it 25 is to perform timer programming. All one needs to do is find the program one wants to watch and enter the compressed code. This is in contrast to having to deal with all the channel, date, time and length entries separately. At least the channel, date and time are explicitly stated in the television guide. The length 30 is usually only available by searching the guide to find the time of day section 204 where a new program begins and then performing some arithmetic to find the length of the program. Using the compressed G-code avoids all these complications.

For cable television programs, there is an additional issue that needs to be addressed for the compressed G-code to be useful. In a normal television guide, CDTL information is available for all the normal broadcast channels in the form of numbers including the channel numbers, such as channel 4 or 7. However, for cable channels like HBO, ESPN etc., only the names of the channels are provided in most television listings. The reason for this is that in some metropolitan areas, such as Los Angeles, there may be only one (1) edition of television guide, but there may be quite a few cable carriers, each of which may assign HBO or ESPN to different cable channel numbers. In order for a compressed code such as the G-code to be applicable to the cable channels as published by a wide area television guide publication, the following approach can be used.

15

First, all the cable channels would be permanently assigned a unique number, which would be valid across the nation. For example, we could assign ESPN to cable channel 1, HBO as cable channel 2, SHO as cable channel 3, etc. This assignment would be published by the television guide publications.

20

The video cassette recorder apparatus, such as the remote controller, the VCR unit or both, could then be provided with two (2) extra modes: "set" and "cable channel". One way of providing the user interface to these modes would be to provide two (2) extra buttons: one called SET and one called CABLE CHANNEL. The buttons could be located on the video cassette recorder unit itself or located on a remote controller, as shown in FIGs 1, 3 and 5, where SET is element 168 and CABLE CHANNEL is element 170.

30 Of course, other user interfaces are possible.

Next, the television viewer would have to go through a one-time "setting" procedure of his VCR for all the cable channels that he would likely watch. This "setting" procedure would

5 relate each of the assigned numbers for each cable channel to the channel number of the local cable carrier. For example, suppose that the local cable carrier uses channel 6 for ESPN, then cable channel number 1 could be assigned to ESPN, as shown in the following table.

	<u>Cable Channel Assigned</u>		<u>Channel Number in</u>
	<u>Name</u>	<u>Cable Chan. No.</u>	<u>the local cable carrier</u>
10	ESPN	1	6
	HBO	2	24
	SHO	3	23
15	.	.	.
	.	.	.
	.	.	.
	DIS	8	25

20 The user could perform the "setting" procedure by pushing the buttons on his remote controller as follows:

25           SET 06 CABLE CHANNEL 1 PROGRAM  
           SET 24 CABLE CHANNEL 2 PROGRAM  
           SET 23 CABLE CHANNEL 3 PROGRAM  
           SET 25 CABLE CHANNEL 8 PROGRAM

30 The "setting" procedure would create a cable channel address table 162, which would be loaded into RAM 52 of command controller 36. For the above example, the cable channel address table 162 would have the following information.

CABLE CHANNEL ADDRESS TABLE 162

1    6

2 24

28

3 23

5

8 25

After the "setting" procedure is performed, the TV viewer can now select cable channels for viewing by the old way: eg. 10 pushing the key pad buttons 24 will select HBO. He can also do it the new way: eg. by pushing CABLE CHANNEL 2, which will also select HBO. The advantage of the new way is that the television 15 guide will publish [C2] next to the program description, so the viewer will just look up the assigned channel number instead of having to remember that HBO is local cable channel 24. When the 20 CABLE CHANNEL button is pushed, command controller 36 knows that it will look up the local cable channel number in cable channel address table 162 to tune the VCR to the correct channel.

20 For timer preprogramming and for using the compressed G-code, a way to differentiate between broadcast and cable channels is to add an eighth channel bit, which would be set to 0 for 25 normal broadcast channels and 1 for cable channels such as HBO. This eighth channel bit could be one of the low order bits such as the third bit  $C_3$  out of the eight channel bits, so that the 30 number of bits to specify popular channels is minimized, whether they be normal broadcast or cable channels. For a normal broadcast channel, the 7 other bits can be decoded according to priority vector C table 124. For a cable channel, the 7 other bits can be decoded according to a separate cable channel priority vector table 160, which could be stored in ROM 54 of microcontroller 36. The cable channel priority vector table can be set ahead of time for the entire country or at least for an

area covered by a particular wide area television guide publication.

5 A television guide that carries the compressed code known as the G-code will now print the cable channel information as follows:

6:30 pm  
[C2] HBO xxxxxxxxxxxxxxxxxxxxxxxx (4679)  
10 xxxxxxxx(program description)xxxxxxxx  
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

15 The [C2] in front of HBO reminds the viewer that he needs only to push CABLE CHANNEL 2 to select HBO. The (4679) is the G-code for this particular program.

20 FIG. 8 shows a section of a television guide. The cable channels all have an assigned cable channel number 188 after the cable channel mnemonic. Other than that the cable channel information is arranged the same as the broadcast channels with a compressed G-code 212 associated with the channel.

25 For timer preprogramming, the viewer need only enter the number 4679 according to the unit's G-code entry procedure, eg. PROG 4679 PROG. The G-code decoder unit will decode this G-code into "cable channel 2" and will also signal the command controller 36 with a cable channel signal 164, as shown in FIGS. 1 and 2, because the extra channel bit will be "1" which distinguishes that the G-code is for a cable channel; then, since 30 the association of "cable channel 2" with channel 24 has been established earlier in the "setting" procedure, the command controller, if it has received a cable channel signal, will immediately look up 2 in the cable channel address table 162 to translate it to cable channel 24, which will be used as the

recording channel at the appropriate time. By associating the G-code with the assigned cable channel number rather than the local cable channel number, the G-code for that program will be valid in the whole local area, which may have many different cable carriers, each of which may have different local cable channel numbers.

To include the cable channel compressed G-code feature, the decoding and encoding algorithms are as shown in FIGS 9 and 10, respectively. The encoding should be explained first before the decoding. The primary change in FIG. 10 from FIG. 7 is that a cable channel priority vector table 160 has been added and is used in look up priority step 180 if a cable channel is being encoded. Also if a cable channel is being encoded then the cable channel bit is added in the correct bit position in the convert  $C_p D_p T_p L_p$  to binary numbers step 182. This could be bit  $C_3$ , as discussed before. The bit hierarchy key could be determined as before to compress the number of bits in the most popular programs; however, it needs to be 23 bits long to accommodate the cable channel bit. The maximum compressed G-code length could still be 7 digits, because  $2^{23} = 8,388,608$ .

The decoding is shown in FIG. 9 and is just the reverse of the encoding process. After step 108, test cable channel bit 174 is added and effectively tests the cable channel bit to determine if it is a "1". If so then the command controller 36 is signaled via cable channel signal 164 of FIGS. 1 and 2 that the CDTL 118 that will be sent to it from G-code decoder 38 is for a cable channel. Then the command controller knows to look up the local cable carrier channel number based on the assigned cable channel number. In step 176 of FIG. 9, the priority vector tables including the cable channel priority vector table 160 are used to look up the CDTL 118 information.

5 An alternate to having the command controller receive a cable channel signal 164 is for the G-code decoder to perform all of the decoding including the conversion from assigned cable channel number to local cable carrier number. This would be the  
10 case for the remote controller implementation of FIG. 3. FIG. 11 shows the implementation of the entire decode algorithm if this step is included. All that needs to be added is convert assigned channel to local cable carrier channel step 166, which performs a lookup in cable channel address table 162, if the cable channel bit indicates that a cable channel is involved. Step 166 effectively replaces step 174 in FIG. 9.

15 Another issue that needs addressing is the number of programs that can be preprogrammed. Since the G-code greatly simplifies the process of entering programs, it is likely that the user will quickly learn and want to enter a large number of programs; however, some existing VCRs can only store up to four (4) programs, while some can store as many as eight. Thus, the user may get easily frustrated by the programming limitations of  
20 the VCR.

25 One approach to this problem, is to perform the compressed G-code decoding in the remote controller and provide enough memory there to store a large number of programs, eg. 20 or 40. The remote controller would have the capability of transferring periodically several of these stored programs at a time to the VCR main unit. To provide this capability, extra memory called stack memory 76 is required inside the remote unit, as shown in Fig. 12, which other than that is identical to FIG. 4. Stack  
30 memory 76 can be implemented with a random access memory, which may in fact reside in the microcontroller itself, such as RAM 62.

The stack memory 76 is where new entry, insertion & deletion of timer preprogramming information is carried out. It is also

where editing takes place. The top memory locations of the stack, for example the first 4 locations, correspond exactly to the available timer preprogramming memory in the VCR main unit. Whenever the top of the stack memory is changed, the new 5 information will be sent over to the VCR main unit to update it.

FIG. 13 shows the sequence of events when the user enters a G-code program on the keypad of the remote controller. For illustration purposes, suppose the VCR main unit can only handle 10 four (4) programs. Suppose also that the stack memory capacity is 20 timer preprograms. Referring to the flow chart in FIG.13, when the user enters a G-code in step 230, the microcontroller 60 first decodes it into the CDTL information in step 234 and displays it on the display unit with the additional word 15 "entered" also displayed. The microcontroller then enters the decoded program into the stack memory in step 236.

If this is the first program entered, it is placed at the top location of the stack memory. If there are already programs 20 in the stack memory, the newly entered program will first be provisionally placed at the bottom of the stack memory. The stack memory will then be sorted into the correct temporal order in step 240, so that the earliest program in time will appear in the top location and the last program in time will be at the 25 bottom. Notice that the nature of the temporally sorted stack memory is such that if stack memory location n is altered, then all the locations below it will be altered.

For example, suppose the stack memory has six (6) entries 30 already temporally ordered, and a new entry is entered whose temporal ordering places it in location 3 (1 being the top location). If this entry is placed into location 3, information which was in location 3, 4, 5, 6 will be shifted to locations 4, 5, 6, and 7. Locations 1 and 2 will remain unchanged.

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entries over to "replenish" the VCR main unit (if the stack has more than 4 entries).

The real time clock 85 in the remote controller unit is  
5 monitored by the microcontroller to determine when the programs in the main unit have been used up. Referring to the flow chart in FIG. 14, the microcontroller periodically checks the clock and the times for the programs at the top of the stack in step 250 (say the first 4 entries), which are identical to the VCR's main  
10 unit's menu. If on one of the periodic checks, it is determined that the recording of the main unit's menu is complete, then if there are more entries in the stack, which is tested in step 252, the display unit will be set to a blinking mode or display a blinking message in step 258 to alert the user to send more  
15 programs. Next time the user picks up the remote unit, the blinking will remind him that the VCR main unit's program menu has been completed and it is time to replenish the VCR main unit with program entries stored in the remote. The user simply picks up the remote and points it towards the VCR main unit and presses  
20 "ENTER". This will "pop" the top of the stack memory in step 260, ie. pop all the entries in the stack up by four locations. The microcontroller will then send the new "top of the stack" (ie. top 4 entries) over to the VCR main unit in step 262. This process will repeat until the whole stack has been emptied.

25

It is thought that the apparatus and method for using encoded video recorder/player timer preprogramming information of the present invention and many of its attendant advantages will be understood from the foregoing description and it will be  
30 apparent that various changes may be made in the form, construction and arrangement of the parts thereof without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore

described being merely a preferred or exemplary embodiment thereof.

CLAIMS

We claim:

5 1. A recorder using compressed codes for recorder timer preprogramming that comprises:

means for entering and transmitting a compressed code having at least one digit;

10 means for receiving a command signal coupled to said means for entering and transmitting a compressed code having at least one digit;

15 means for command control for interpreting that a received signal is a compressed code having at least one digit and for controlling a recorder, electrically coupled to said means for receiving a command signal;

a means for keeping time electrically coupled to said means for command control;

20 means for decoding a compressed code having at least one digit into channel, date, time and length information electrically coupled to said means for command control;

means for recording and playback;

means for turning said means for recording and playback on and off in response to said date, time and length information;

25 and

means for tuning channels electrically coupled to a signal input and to said means for recording and playback and to said means for command control and responsive to said channel information.

30

2. The recorder using compressed codes for recorder timer preprogramming of claim 1 wherein:

said means for keeping time is electrically coupled to said means for decoding a compressed code having at least one digit into channel, date, time and length information; and

5 wherein the decoding of a compressed code by said means for decoding a compressed code into channel, date, time and length information is a function of the time of said means for keeping time.

10 3. The recorder using compressed codes for recorder timer preprogramming of claim 2 which further comprises:

15 means coupled to said means for command control for daily using said channel, date, time and length (CDTL) information decoded from said compressed code having at least one digit wherein the start date is the date specified in said channel, date, time and length (CDTL) information for recording a program daily.

20 4. The recorder using compressed codes for recorder timer preprogramming of claim 2 which further comprises:

25 means coupled to said means for command control for weekly using said channel, date, time and length (CDTL) information decoded from said compressed code having at least one digit wherein the start date is the date specified in said channel, date, time and length (CDTL) information for recording a program weekly.

30 5. The recorder using compressed codes for recorder timer preprogramming of claim 2 wherein said means for entering and transmitting a compressed code having at least one digit comprises:

means for remote control having a signal transmit means coupled to said means for command control receiver; and

means for entering a compressed code having at least one digit electrically coupled to said means for remote control.

5

6. The apparatus for using encoded video recorder/player timer preprogramming information of claim 2 wherein said means for entering and transmitting a compressed code comprises:

10 means for manual control electrically coupled to said means for a command signal receiver; and

means for compressed code entry means electrically coupled to said means for manual control.

15 7. A recorder using compressed codes for recorder timer preprogramming that comprises:

means for remote control having a means for transmitting signals;

20 means for entering a compressed code having at least one digit electrically coupled to said means for remote control;

means for decoding a compressed code having at least one digit into channel, date, time and length information electrically coupled to said means for remote control;

25 means for receiving a command signal coupled to said means for transmitting signals on said means for remote control;

means for command control for controlling a recorder electrically coupled to said means for receiving a command signal;

30 a first means for keeping time electrically coupled to said means for command control;

means for recording and playback;

means for turning said means for recording and playback on and off in response to said date, time and length information

sent from said means for remote control to said means for command control; and

5. means for tuning channels electrically coupled to a signal input and to said means for recording and playback and to said means for command control and responsive to said channel information sent from said means for remote control to said means for command control.

10 8. The recorder using compressed codes for recorder timer preprogramming of claim 7 that further comprises:

a second means for keeping time electrically coupled to said means for decoding a compressed code having at least one digit into channel, date, time and length information;

15 wherein the decoding of a compressed code by said means for decoding a compressed code into channel, date, time and length information is a function of the time of said second means for keeping time.

20 9. The recorder using compressed codes for recorder timer preprogramming of claim 8 which further comprises:

means coupled to said command controller for daily using said channel, date, time and length (CDTL) information decoded 25 from said compressed code having at least one digit wherein the start date is the date specified in said channel, date, time and length (CDTL) information for recording a program daily.

30 10. The recorder using compressed codes for recorder timer preprogramming of claim 8 which further comprises:

means coupled to said command controller for weekly using said channel, date, time and length (CDTL) information decoded from said compressed code having at least one digit wherein the

start date is the date specified in said channel, date, time and length (CDTL) information for recording a program weekly.

11. A recorder using compressed codes for recorder timer  
5 preprogramming that comprises:

means for universal remote control having a means for transmitting signals and a means for receiving signals;

10 a learn switch electrically coupled to said means for universal remote control wherein when said learn switch is "ON" said means for universal remote control can learn another remote controller functions via said means for receiving signals;

means entering a compressed code having at least one digit electrically coupled to said means for universal remote control;

15 means for decoding a compressed code having at least one digit into channel, date, time and length information electrically coupled to said means for universal remote control;

means for receiving a command signal coupled to said means for transmitting signals on said universal remote control;

20 means for command control for controlling a recorder electrically coupled to said means for receiving a command signal;

a first means for keeping time electrically coupled to said means for command control;

25 means for recording and playback;

means for turning said means for recording and playback on and off in response to said date, time and length information sent from said means for remote control to said means for command control; and

30 means for tuning channels electrically coupled to a signal input and to said means for recording and playback and to said means for command control and responsive to said channel information sent from said means for remote control to said means for command control.

12. The recorder using compressed codes for recorder timer preprogramming of claim 11 that further comprises:

5 a second means for keeping time electrically coupled to said means for decoding a compressed code having at least one digit into channel, date, time and length information; and

10 wherein the decoding of a compressed code by said means for decoding a compressed code into channel, date, time and length information is a function of the time of said second means for keeping time.

13. The recorder using compressed codes for recorder timer preprogramming of claim 12 which further comprises:

15 means coupled to said command controller for daily using said channel, date, time and length (CDTL) information decoded from said compressed code having at least one digit wherein the start date is the date specified in said channel, date, time and length (CDTL) information for recording a program daily.

14. The recorder using compressed codes for recorder timer preprogramming of claim 12 which further comprises:

25 means coupled to said command controller for weekly using said channel, date, time and length (CDTL) information decoded from said compressed code having at least one digit wherein the start date is the date specified in said channel, date, time and length (CDTL) information for recording a program weekly.

30 15. A method for using compressed codes for recorder timer preprogramming comprising the steps of:

providing a program guide wherein each program description has a compressed code of at least one digit associated with said program description representing the channel, date, time and length of the program;

5 providing a means for entering a compressed code of at least one digit to perform timer preprogramming for each selected program;

providing a means for decoding a compressed code;  
decoding said compressed code of at least one digit into  
10 channel, date, time and length information;

providing a clock means for keeping time;

comparing said date, time and length information to said  
clock means;

providing a means for tuning channels;  
15 tuning said means for tuning channels to the channel  
indicated by said channel information when said clock means  
compares with said date and time information;

providing a means for recording and playback;  
turning said means for record and playback on for record  
20 when said clock means compares with said date and time  
information; and

turning said means for recording and playback means off for  
record when said length information matches time of recording on  
said clock means.

25 16. The method for using compressed codes for recorder timer  
preprogramming of claim 15 wherein the step of decoding said  
compressed code of at least one digit into channel, date, time  
and length information further comprises the steps of:

30 converting said compressed code of at least one digit into a  
compressed code of binary bits;  
providing a bit hierarchy key that specifies the reordering  
of said compressed code of binary bits;

reordering all the bits in said compressed code of binary bits according to said bit hierarchy key to obtain a reordered binary compressed code;

5 separating said reordered binary compressed code into binary channel, date, time and length priority indices;

providing priority vectors for channel, date, time and length; and

10 using said channel, date, time and length priority indices to lookup channel, date, time and length information from said priority vectors for channel, date, time and length, respectively.

17. The method for using compressed codes for recorder timer preprogramming of claim 16 wherein the step of decoding said 15 compressed code of at least one digit into channel date time and length information further comprises the steps of:

providing a plurality of bit hierarchy keys; and  
selecting one of said plurality of bit hierarchy keys for 20 use as a function of the time of said clock means.

18. The method for using compressed codes for recorder timer preprogramming of claim 16 wherein the step of decoding said compressed code of at least one digit into channel date time and 25 length information further comprises the steps of:

providing multiple sets of priority vectors for channel, date, time and length; and

selecting one of said multiple sets of priority vectors for 30 channel, date, time and length for use as a function of the time of said clock means.

19. The method for using compressed codes for recorder timer preprogramming of claim 16 which further comprises the steps of:

providing a means for daily comparing said clock means to the channel, time and length information in said channel, date, time and length information starting on the date specified in said channel, date, time and length information;

5 tuning said means for tuning channels to the channel indicated by said channel information when said clock means compares with said time information;

10 turning on recording for said means for recording and playback when said clock means compares with said time information; and

turning off recording for said means for recording and playback when said length information matches time of recording on said clock means.

15

20. The method for using compressed codes for recorder timer preprogramming of claim 16 which further comprises the steps of:

providing a means for comparing weekly said clock means to the channel, time and length information in said channel, date, time and length information starting on the date specified in said channel, date, time and length information;

25 tuning said means for tuning channels to the channel indicated by said channel information when said clock means is compared weekly and compares with said time information;

turning on recording for said means for recording and playback when said clock means is compared weekly and compares with said time information; and

30 turning off recording for said means for recording and playback when said length information matches time of recording on said clock means.

21. The method of using encoded video recorder/player timer preprogramming information of claim 15 wherein the step of decoding said compressed code of one to many digits into channel date time and length information further comprises the step of:

5 periodically using different algorithms for decoding said compressed code of one to many digits into channel date time and length information.

10 22. The method of using encoded video recorder/player timer preprogramming information of claim 15 wherein the step of decoding said compressed code of one to many digits into channel date time and length information further comprises the steps of:

15 converting said compressed code of one to many digits into a compressed mixed radix number code;

providing a hierarchy key that specifies the reordering of said compressed mixed radix number code;

20 reordering all the numbers in said compressed mixed radix code according to said hierarchy key to obtain a reordered compressed mixed radix code;

separating said compressed mixed radix code into channel, date, time and length priority indices;

25 providing priority vectors for channel, date, time and length; and

using said channel, date, time and length priority indices to lookup channel, date, time and length information from said priority vectors for channel, date, time and length.

30 23. A method of encoding a set of codes to represent a multidimensional vector to minimize the length of codes which are most often used based on the relative probabilities of the values in each dimension in order to assist in making it easier to

select multidimensional vectors for commercial or industrial applications comprising the steps of:

5 entering an input value for each dimension of the multidimensional vector;

10 providing a priority vector table for each dimension of the multidimensional vector wherein the priority vector table for each dimension lists every possible value in the dimension in the order of its relative priority and assigns a unique priority number to every possible value;

15 performing a table lookup in said priority vector table on said input value for each dimension to find its unique priority numbers;

20 converting each said unique priority number for said input value for each dimension to a binary number and concatenating the resulting binary numbers to form one long binary number;

25 providing a binary bit hierarchy key arranged in the order of highest differential probability to least differential probability of the combination of bits representing all the dimensions of the multidimensional vector, wherein the differential probability is a measure of the relative importance of a bit from one dimension over a bit from another dimension in minimizing the length of codes which are most often used;

30 reordering all bits in said one long binary number according to the order of said binary bit hierarchy key to form a compressed code; and

35 using said compressed code to select multidimensional vectors for commercial or industrial applications.

30 24. The method of claim 23 wherein the step of reordering all bits in said one long binary number according to the order of said binary bit hierarchy key further comprises the step of converting the resulting binary number to decimal.

25. The method of claim 23 wherein the step of providing a binary bit hierarchy key arranged in the order of highest differential probability to least differential probability of the combination of bits representing all the dimensions of the multidimensional vector, wherein the differential probability is a measure of the relative importance of a bit from one dimension over a bit from another dimension in minimizing the length of codes which are most often used further comprises interchanging some of the bits on a periodic basis for security reasons.

10

26. The method of claim 23 wherein the step of using the resulting compressed code to select multidimensional vectors for commercial or industrial applications further comprises:

15 decoding the compressed code into its original input values for each dimension of the multidimensional vector.

27. The method of claim 26 wherein the step of decoding the compressed code into its original input values for each dimension of the multidimensional vector further comprises:

20

providing a binary bit hierarchy key arranged in the order of highest differential probability to least differential probability of the combination of bits representing all the dimensions of the multidimensional vector, wherein the differential probability is a measure of the relative importance of a bit from one dimension over a bit from another dimension in minimizing the length of codes which are most often used;

25 reversing the step of reordering all bits in said one long binary number according to the order of said binary bit hierarchy key;

30 grouping the reordered bits into those belonging to each dimension and converting the resulting binary numbers to decimal priority numbers;

providing a priority vector table for each dimension of the multidimensional vector wherein the priority vector table for each dimension lists every possible value in the dimension in the order of its relative priority and assigns a unique priority number to every possible value; and

looking up a value for each dimension of the multidimensional vector in each said priority vector table by using said decimal priority numbers as an index to each said priority vector table.

10 28. A method of encoding a set of codes to represent a multidimensional vector to minimize the length of codes which are most often used based on the relative probabilities of the values in each dimension in order to assist in making it easier to  
15 select multidimensional vectors for commercial or industrial applications comprising the steps of:

entering an input value for each dimension of the multidimensional vector;

20 providing a priority vector table for each dimension of the multidimensional vector wherein the priority vector table for each dimension lists every possible value in the dimension in the order of its relative priority and assigns a unique priority number to every possible value;

25 performing a table lookup in said priority vector table on said input value for each dimension to find its unique priority numbers and concatenating these unique priority numbers into one number; and

30 using the resulting code to select multidimensional vectors for commercial or industrial applications.

29. A television calendar for combined visual selection of programs for direct viewing and for use in automatic recording of programs for future viewing, the combination comprising:

a day section and positioned in relation therewith an associated unique day visual identifier, for each of a plurality of calendar days;

5 a time-of-day section and positioned in relation therewith an associated unique time-of-day visual identifier, within each day section, for each of a plurality of television program starting times;

10 a plurality of unique channel visual indications and corresponding to each such channel visual indication, a descriptive program indication within each time-of-day section for each television program that starts at the time of such time-of-day section; and

15 an additional unique coded indication for the start of each said television program positioned in a predetermined relation to each said channel visual indication, the coded indication representing the channel corresponding to said channel visual indication for said television program, the time of day corresponding to said time-of-day visual indication for said 20 time-of-day section for said television program, the calendar day corresponding said day visual identifier for said day section in which said television program appears, and the length of time for said television program.

25 30. A television calendar on a display medium for combined visual selection of programs for direct viewing and for automatically programming a video recorder for time-shifted viewing, the combination comprising:

30 a day-of-year section for each of a plurality of calendar days, the day-of-year sections being ordered sequentially on the display medium by calendar day and each of the day-of-year sections being positioned in relation to a unique day-of-year visual indicator on the display medium;

5 a time-of day section for each of a plurality of television program starting times within a calendar day, the time-of-day sections being ordered sequentially on the display medium by time within each day-of-year section and each of the time-of-day sections being positioned in relation to a unique time-of-day visual indicator on the display medium;

10 a plurality of unique channel indications on the display medium within each of the time-of-day sections, each channel indication further being positioned corresponding to a descriptive program indication for each television program that begins at the starting time indicated by the time-of-day section; and

15 a plurality of unique coded indications, each corresponding to and positioned on the display medium in relation to a unique channel indication and its corresponding descriptive program indication, each of the unique coded indications representing a unique television channel represented by the channel indications, the time of day represented by the time-of-day indications for the corresponding time-of-day section, the calendar day represented by the day-of-year indications for the corresponding day-of-year section, and the duration of the corresponding television program.

20 31. A method of creating a television calendar for combined visual selection of programs for direct viewing and for use in automatic recording of programs for future viewing, comprising the steps of:

25 30 providing a coded date visual identifier representing the date on which the television program will be broadcasted;

providing a coded time-of-day visual identifier representing the time that the program will be broadcasted;

providing a coded channel visual identifier representing the channel of the program; and

providing a coded length visual identifier representing the duration of the program.

32. A system for the automatic recording of a television program  
5 on a video recorder comprising:

a television calendar listing television programs by the date and time of each program and the television channel on which each program is to appear, the calendar having a unique  
10 compressed code indication corresponding to the start of each different listed program and representing the date and time the program is to start, the channel on which the program will appear, and the duration of the program; and

15 a controller for the video recorder for receiving representations of the compressed coded indications and for enabling such video recorder to commence recording television signals carrying the program on the channel, on the date, at the time and terminating after the duration represented by any of said compressed coded indications.

20 33. The system of claim 32 wherein the controller comprises:

input for receiving the representation of the compressed code indications;

25 a decoder for decoding the compressed code indications into corresponding channel, date, time and duration information;

a channel selector for selecting the channels identified in the compressed code indications decoded by said decoder; and

30 an on/off controller for enabling recording by the video recorder for a television program by activating said channel selector to select the corresponding channel as decoded for that television program and turning on the recording commencing at a date and a time as decoded for the television program and terminating recording after the duration decoded for the

television program represented by the same compressed coded indication that is decoded by the decoder.

34. A video cassette recorder controller for automatically enabling recording by a video cassette recorder of a channel of video signals specified by a coded channel signal beginning at the time of day specified by a coded time-of-day signal, on the calendar day specified by a coded day signal and for the length of time specified by a coded length signal, the improvements comprising:

an input for receiving a compressed coded signal representative of and compressed in length from, the combination of said coded channel, time-of-day, day and length signals; and  
15 a decoder for decoding and expanding said compressed coded signal to said individual coded channel, time-of-day, day and length signals for control of such controller.

35. The video controller of claim 34 wherein the input and decoder are an integral part of the controller.

36. The video controller of claim 34 comprising a remote handheld transmitter comprising said input and decoder.

25 37. The video controller of claim 35 or 36 wherein the input comprises a keyboard entry device.

38. The video controller of claim 35 or 36 wherein the decoder comprises a microprocessor.

30 39. A method of programming a video cassette recorder controller for automatically enabling recording by a video cassette recorder of a channel of video signals specified by a coded channel signal beginning at the time of day specified by a coded time-of-day

signal, on the calendar day specified by a coded day signal and for the length of time specified by a coded length signal, the steps comprising:

5 receiving a compressed coded signal representative of and compressed in length from, the combination of said coded channel, time-of-day, day and length signals; and

10 decoding and expanding said compressed coded signal to said individual coded channel, time-of-day, day and length signals for control of such controller.

40. The method of claim 39 comprising the step of receiving the compressed coded signals in the controller.

15 41. The method of claim 39 comprising the step of receiving the compressed coded signal in a remote handheld transmitter.

20 42. The method of claim 40 or 41 wherein the step of receiving comprises the step of inputting the compressed coded signal through a keyboard entry device.

43. The method of claim 40 or 41 wherein the step of decoding comprises the step of decoding the compressed coded signal which comprises a microprocessor.

25 44. An apparatus for decoding television program information, including channel, date, time, and length of the program, for automatically recording television programs with a television said apparatus comprising:

30 means for entering encoded data into the apparatus;  
means for decoding said encoded data to determine the date, time, channel and length of the program to be recorded; and

means for generating control signals from said encoded data for control of the video recorder to select the channel and to activate and stop the recording of the video recorder.

5 45. A method of using a set of codes to represent a multidimensional vector to minimize the length of codes which are most often used based on the relative probabilities of the values in each dimension in order to assist in making it easier to select multidimensional vectors for commercial or industrial  
10 applications comprising the steps of:

entering an input value for each dimension of the multidimensional vector;

15 providing a priority vector table for each dimension of the multidimensional vector wherein the priority vector table for each dimension lists every possible value in the dimension in the order of its relative priority and assigns a unique priority number to every possible value;

20 performing a table lookup in said priority vector table on said input value for each dimension to find its unique priority numbers;

25 converting each said unique priority number for said input value for each dimension to a number in a fixed or mixed radix system and concatenating the resulting numbers to form one long number;

30 providing a hierarchy key arranged in the order of highest differential probability to least differential probability of the combination of numbers representing all the dimensions of the multidimensional vector and all the radix positions within each number of fixed or mixed radix, wherein the differential probability is a measure of the relative importance of a radix position of a number from one dimension over a radix position of a number from another dimension in minimizing the length of codes which are most often used;

reordering all numbers in said one long number according to the order of said hierarchy key to form a compressed code; and using said compressed code to select multidimensional vectors for commercial or industrial applications.

5

46. The method of claim 45 wherein the step of using the resulting compressed code to select multidimensional vectors for commercial or industrial applications further comprises:

10 decoding the compressed code into its original input values for each dimension of the multidimensional vector.

47. The method of claim 46 wherein the step of decoding the compressed code into its original input values for each dimension of the multidimensional vector further comprises:

15

providing a hierarchy key arranged in the order of highest differential probability to least differential probability of the combination of numbers representing all the dimensions of the multidimensional vector and all the radix positions within each 20 number of fixed or mixed radix, wherein the differential probability is a measure of the relative importance of a radix position of a number from one dimension over a radix position of a number from another dimension in minimizing the length of codes which are most often used;

25 reversing the step of reordering all numbers in said one long number according to the order of said hierarchy key;

grouping the reordered numbers into those belonging to each dimension to form priority numbers;

30 providing a priority vector table for each dimension of the multidimensional vector wherein the priority vector table for each dimension lists every possible value in the dimension in the order of its relative priority and assigns a unique priority number to every possible value; and

looking up a value for each dimension of the multidimensional vector in each said priority vector table by using said priority numbers as an index to each said priority vector table.

5

48. A television calendar of claim 29, the combination further comprising:

10 a plurality of unique cable channel visual indications and corresponding to each such cable channel visual indication, a descriptive program indication within each time-of-day section for each cable television program that starts at the time of such time-of-day section; and

15 an assigned cable channel number positioned in a predetermined relation to each said cable channel visual indication, the assigned cable channel number representing the cable channel corresponding to said cable channel visual indication for said cable television program and being valid for a wide area spanning multiple local cable carriers.

20

49. A television calendar of claim 30, the combination further comprising:

25 a plurality of unique cable channel indications on the display medium within each of the time-of-day sections, each cable channel indication further being positioned corresponding to a descriptive program indication for each cable television program that begins at the starting time indicated by the time-of-day section; and

30

a plurality of assigned cable channel numbers, each corresponding to and positioned on the display medium in relation to a unique cable channel indication and its corresponding descriptive program indication, each of the assigned cable channel numbers representing a unique cable television channel

represented by the cable channel indications and being valid for a wide area spanning multiple local cable carriers.

5 50. The method of using encoded video recorder/player timer preprogramming information of claim 16 or 22 wherein the step of decoding said compressed code of one to many digits into channel date time and length information further comprises the step of:

10 testing whether said channel information is for an assigned cable channel and if so converting said channel information into local cable carrier channel information.

15 51. The method of controlling a television controller for selecting a cable channel for viewing, the steps comprising:

15 providing a television calendar with assigned cable channel numbers associated with each cable channel;

20 providing a television controller having a cable channel address table with memory for a set of assigned cable channel numbers and a corresponding set of local cable carrier channel numbers and having the capability to convert an assigned cable channel number into a local cable carrier channel number by using said cable channel address table;

25 setting up said cable channel address table with said set of assigned cable channel numbers and said corresponding set of local cable carrier channel numbers;

entering an assigned cable channel number corresponding to a cable channel selected for viewing; and

30 conversion of said assigned cable channel number into a corresponding local cable carrier channel number by said television controller.

52. The apparatus for using encoded video recorder/player timer preprogramming information of claim 1 wherein:

5 said means for decoding a compressed code into channel, date, time and length information electrically coupled to said means for command control further comprises a means for detecting that said channel information corresponds to an assigned cable channel number; and

10 said means for command control further comprises a means for converting an assigned cable channel number into a local cable carrier channel number.

15 53. The apparatus for using encoded video recorder/player timer preprogramming information of claim 7 or 11 wherein said means for decoding a compressed code into channel, date, time and length information electrically coupled to said means for remote control further comprises:

a means for detecting that said channel information corresponds to an assigned cable channel number; and

20 a means for converting an assigned cable channel number into a local cable carrier channel number.

25 54. The apparatus for using encoded video recorder/player timer preprogramming information for a recorder of claim 7 or 11 further comprises:

a stack memory coupled to said means for decoding a compressed code for storing a plurality of programs consisting of channel, date, time and length information for timer preprogramming; and

30 a second means for keeping time electrically coupled to said means for decoding a compressed code into channel, date, time and length information.

55. The method of permitting a large number of programs to be timer preprogrammed for recording by a video cassette recorder for time shifted viewing where the video cassetter recorder can store only N timer preprogrammed programs, the steps comprising:

5 providing a remote controller having a means for keeping time;

10 entering into said remote controller compressed codes, each representative of, and compressed in length from, the combination of channel, time-of-day, day and length information for a program; and

15 decoding each compressed code to channel, time-of-day, day and length information;

providing a memory;

15 entering each said channel, time-of-day, day and length information into said memory;

reordering said channel, time-of-day, day and length information in said memory into temporal order; and

20 testing whether first N entries in said memory have changed and if yes, sending changed entries in first N entries to said video cassette recorder.

56. The method of permitting a large number of programs to be timer preprogrammed of claim 55, the steps further comprising:

25 periodically checking whether stop time of Nth entry of said first N entries in memory has passed; and

30 if stop time of Nth entry has passed and number of entries in memory is greater than N, then turning on a means for alerting a user to activate remote controller to send more programs to said video cassette recorder and once remote controller is activated, setting next N entries in said memory to be the first N entries in said memory and sending said first N entries to said video cassette recorder and turning off said means for alerting a user.

57. An apparatus for using encoded video recorder/player timer preprogramming information for a recorder that comprises:

means for remote control having a means for transmitting signals;

means for compressed code entry electrically coupled to said means for remote control;

means for decoding a compressed code into channel, date, time and length information electrically coupled to said means for remote control;

means for storing said channel, date, time and length information in said remote control;

a means for keeping time electrically coupled to said means for remote control;

means for command control electrically coupled to said means for remote control; and

wherein said means for command control compares the stored date, time and length information to said means for keeping track of time and sends at the appropriate time start record and stop record commands and channel select commands to a VCR unit via said transmit signals from said means for remote control.

58. The apparatus for using encoded video recorder/player timer preprogramming information for a recorder of claim 57 that further comprises:

means for storing a plurality of sets of transmit signals for different VCR models commands electrically coupled to said means for remote control; and

means for selecting for a particular VCR model a set of transmit signals for sending commands.

59. The apparatus for using encoded video recorder/player timer preprogramming information for a recorder of claim 57 wherein:

5 said means for remote control is a universal remote controller and can learn a set of transmit signals for sending commands to a particular VCR.

## AMENDED CLAIMS

[received by the International Bureau on 17 July 1990 (17.07.90);  
original claims 1-59 cancelled and replaced by new claims 60-146;  
original claims 15 and 16 replaced by new claim 60;  
new claims 61-120 added; original claims 1-14 replaced by new claims 121-134;  
original claims 51-59 replaced by new claims 135-143;  
new claims 144-146 added (32 pages)]

1 60. A method of using compressed codes for recorder  
2 preprogramming comprising the steps of:

3 providing a television guide wherein each program  
4 description has an associated compressed code representing the  
5 channel, date, time and length of the program;

6 providing a means for entering a compressed code  
7 having at least one digit;

8 providing a means for decoding a compressed code  
9 having at least one digit into channel, date, time and length  
10 commands;

11 converting said compressed code into a binary  
12 compressed code;

13 providing a bit hierarchy key that specifies the  
14 reordering of said binary compressed code;

15 reordering all the bits in said compressed code  
16 according to said bit hierarchy key to obtain a reordered  
17 binary compressed code;

18 separating said reordered binary compressed code into  
19 binary channel, date, time and length priority indices;

20 providing priority vectors for channel, date, time  
21 and length;

22 using said channel, date, time and length priority  
23 indices to lookup channel, date, time and length commands from  
24 said priority vectors for channel, date, time and length;

25 providing a clock means for keeping time;

26 comparing said date, time and length commands to said  
27 clock means:

28 providing a means for tuning channels;

29 tuning said means for tuning channels to the channel  
30 indicated by the channel in said channel, date, time and length  
31 commands when said clock means compares with the date and time  
32 of said channel date time and length commands;

33 providing a means for recording;

34 turning ON said means for recording when said clock  
35 means compares with the date and time of said date and time  
36 commands; and

37 turning OFF said means for recording when said length  
38 of said length command matches time of recording on said clock  
39 means.

1       61. A system for the automatic recording of a television  
2       program on a video cassette recorder comprising:

3 a television calendar visually listing television  
4 programs by the date and time of each program and the  
5 television channel on which each program is to appear, the  
6 calendar having a unique compressed coded indication for each  
7 of the programs comprising a set of digits corresponding to  
8 the start of the corresponding program and representing the  
9 channel on which such program will appear, the date and time  
10 such program is to start, and the length of such program; and

11 a means for automatically controlling recording of  
12 television signals by a video cassette recorder comprising  
13 means for receiving representations of the digits of the  
14 compressed coded indications from the television calendar and  
15 for enabling such video cassette recorder to commence recording  
16 television signals carrying the program on the channel, on the

17       date, at the time and terminating after the length of time  
18       represented by any of said compressed coded indications.

1       62.. The system of claim 61 wherein the means for automatically  
2       controlling recording comprises:

3               an input for receiving the representation of the  
4        digits of each of the compressed coded indications;

5               a decoder for decoding the representation of each of  
6        the compressed coded indications into corresponding separate  
7        channel, date, time and length commands;

8               a channel selector for selecting the channel  
9        identified in the channel command; and

10               an on/off controller for enabling recording by the  
11        video recorder of the television program on the selected  
12        channel and comprising means operative for turning on the  
13        recording commencing at the date and the time specified by the  
14        date and time commands and terminating recording after the  
15        length of time specified by the length command.

1       63. A system for automatically controlling recording by a  
2        video cassette recorder of a channel of video signals under  
3        control of a channel command beginning on the calendar day  
4        specified by a day command, at the time-of-day specified by a  
5        time-of-day command, and for the length of time specified by  
6        a length command, the system comprising:

7               an input for receiving representations of compressed  
8        coded indications, each representative of, and compressed in  
9        length from, the combination of one of each said channel  
10        command, day command, time-of-day command, and length command;  
11        and

12               a decoder for decoding and expanding any said  
13        compressed coded indication to individual channel command, day

14 command, time-of-day command, and length command for control  
15 of the video cassette recorder.

1 64. The system of claim 63 wherein the input and decoder are  
2 an integral part of the video cassette recorder.

1 65. The system of claim 63 comprising a remote transmitter  
2 which comprises said input.

1 66. The system of claim 64 or 65 wherein the video cassette  
2 recorder includes control means for interpreting whether said  
3 compressed coded indication has been received by the video  
4 cassette recorder.

1 67. The system of claim 66 wherein said control means  
2 comprises a microprocessor.

1 68. The system of claim 63 comprising a remote hand  
2 transmitter which comprises said input and decoder.

1 69. The system of claim 68 wherein said remote handheld  
2 transmitter comprises a universal remote controller capable of  
3 learning protocols of different remote controllers with which  
4 said universal remote controller interfaces.

1 70. The system of claim 65 or 68 wherein said input comprises  
2 a keyboard entry device.

1 71. The system of claim 64 or 68 wherein said decoder  
2 comprises a microprocessor.

1       72. The system of 63 comprising a clock for providing an  
2       output as a function of time and wherein the decoder comprises  
3       means for generating said channel, day, time-of-day and length  
4       commands as a function of the output of the clock.

1       73. The system of claim 63 wherein said decoder comprises:  
2               means for converting said compressed coded indication  
3               into a compressed code of binary bits;  
4               means for reordering the bits in said compressed code  
5               of binary bits to obtain a reordered binary compressed code;  
6               means for grouping said reordered binary compressed  
7               code into binary channel, date, time and length priority  
8               numbers; and  
9               means for using said binary channel, date, time and  
10               length priority numbers to derive said channel, day, time-of-  
11               day and length commands.

1       74. The system of claim 73 comprising a clock providing an  
2       output as a function of time and wherein said means for  
3       reordering the bits in said compressed code comprises means  
4       for reordering the bits as a function of the output of the  
5       clock.

1       75. The system of claim 73 comprising a clock providing an  
2       output as a function of time wherein said means for deriving  
3       said channel, day, time-of-day and length commands comprises  
4       means for deriving said channel, day, time-of-day and length  
5       commands as a function of the output of the clock.

1       76. The system of claim 63 wherein said decoder comprises:  
2               means for converting said compressed coded indication  
3               into a compressed code of mixed radix bits;

4           means for reordering the bits in said compressed code  
5        of mixed radix bits to obtain a reordered mixed radix  
6        compressed code;

7           means for grouping said reordered mixed radix  
8        compressed code into mixed radix channel, date, time and length  
9        priority numbers; and

10          means for using said mixed radix channel, date, time  
11        and length priority numbers to derive said channel, day, time-  
12        of-day and length commands.

1       77. The system of claim 63 further comprising:

2           a clock providing an output as a function of time;  
3           means for comparing the day and time-of-day  
4        information to the clock output for a predetermined relation;

5           a channel selector for selecting the channel  
6        specified in the channel command after the predetermined  
7        relation is found to exist; and

8           an on/off controller for enabling recording by the  
9        video cassette recorder of the video signals on the selected  
10      channel comprising means operative for turning on the recording  
11      after the predetermined relation is found to exist.

1       78. The system of claim 77 wherein the controller comprises  
2        means for utilizing the length command to terminate the  
3        recording.

1       79. The system of claim 63 wherein said decoder comprises:

2           means for entering encoded data into the decoder;  
3           means for decoding said encoded data to determine  
4        channel, date, time and length of the channel of video signals  
5        to be recorded; and

6           means for generating control commands from said  
7        encoded data for selection of said channel of video signals  
8        for recording and for control of the video cassette recorder  
9        to start and stop the recording of the selected channel by the  
10      video cassette recorder.

1        80. In a system for automatically controlling recording of  
2        channels of television programs by a video cassette recorder,  
3        apparatus for decoding encoded television program information,  
4        where the program information comprises channel, date, time and  
5        length of the program information, said apparatus comprising:

6           means for entering the encoded information into the  
7        apparatus;

8           means for decoding said decoded encoded information  
9        to determine channel, date, time and length of program to be  
10      recorded; and

11          means for generating control commands from said  
12        decoded information for selection of a channel for recording  
13        and for control of the video cassette recorder to start and  
14        stop the recording of the selected channel by the video  
15      cassette recorder.

1        81. A method of programming a system for automatically  
2        controlling recording by a video cassette recorder of a channel  
3        of video signals specified by a channel command beginning at  
4        the time-of-day specified by a time-of-day command, on the  
5        calendar day specified by a day command and for the length of  
6        time specified by a length command, the steps comprising:

7           receiving compressed coded indications, each  
8        representative of the combination of one of each said channel  
9        command, day command, time-of-day command, and length command;  
10      and

11                    decoding and expanding any said compressed coded  
12                    indications to individual said channel command, day command,  
13                    time-of-day command and length command for control of the video  
14                    cassette controller.

1                    82. The method of claim 81 comprising the step of receiving  
2                    the compressed coded indication in the video cassette recorder.

1                    83. The method of claim 81 comprising the step of receiving  
2                    the compressed coded indication in a transmitter remote from  
3                    the video cassette recorder.

1                    84. The method of claim 82 or 83 wherein the step of receiving  
2                    comprises the step of interpreting whether said compressed  
3                    coded indication has been received by the video cassette  
4                    recorder.

1                    85. The method of claim 84 wherein the step of interpreting  
2                    is performed by a microprocessor.

1                    86. The method of claim 81 comprising the steps of receiving  
2                    the compressed coded indication and decoding and expanding the  
3                    compressed coded indication in a transmitter remote from the  
4                    video cassette recorder.

1                    87. The method of claim 81 further comprising the step of  
2                    using a remote handheld transmitter, which interfaces with  
3                    different remote controllers for learning the protocols of  
4                    the different controllers.

1       88. The method of claim 83 or 86 wherein the step of receiving  
2       comprises the step of inputting the compressed coded  
3       indications with a keyboard entry device.

1       89. The method of claim 82 or 86 wherein the step of decoding  
2       comprises the step of decoding the compressed coded indication  
3       with a microprocessor.

1       90. The method of claim 81 wherein the step of decoding and  
2       expanding comprises the step of performing said decoding and  
3       expanding as a function of the output of a clock.

1       91. The method of claim 81 wherein the step of decoding and  
2       expanding comprises the steps of:

3               converting said compressed coded indication into a  
4       compressed code of binary bits;

5               reordering the bits in said compressed code of binary  
6       bits to obtain a reordered binary compressed code;

7               grouping said reordered binary compressed code into  
8       binary channel, date, time and length priority numbers; and

9               deriving said channel, day, time-of-day and length  
10       commands from said binary channel, date, time and length  
11       priority numbers.

1       92. The method of claim 91 wherein the step of reordering  
2       comprises the step of performing said reordering as a function  
3       of the output of a clock.

1       93. The method of claim 91 wherein the step of deriving  
2       comprises the step of performing said deriving as a function  
3       of the output of a clock.

1       94. The method of claim 81 wherein the step of decoding and  
2       expanding comprises the steps of:

3               converting said compressed coded indication into a  
4       compressed code of mixed radix bits;

5               reordering the bits in said compressed code of mixed  
6       radix bits to obtain a reordered mixed radix compressed code;

7               grouping said reordered mixed radix compressed code  
8       into mixed radix channel, date, time and length priority  
9       numbers; and

10              deriving said channel, day, time-of-day and length  
11       commands from said mixed radix channel, date, time and length  
12       priority numbers.

1       95. The method of claim 81 further comprising the steps of:

2               comparing the day and time-of-day commands to the  
3       output of a clock for a predetermined relation;

4               selecting the channel specified in the channel  
5       command after the predetermined relation is found to exist;  
6       and

7               enabling recording by the video cassette recorder of  
8       the video signals on the selected channel by commencing  
9       recording after the predetermined relation is found to exist.

1       96. The method of claim 95 comprising the step of utilizing  
2       the length command to terminate the recording.

1       97. The method of claim 81 wherein the step of decoding and  
2       expanding comprises the steps of:

3               entering encoded data into the decoder;

4               decoding said encoded data to determine channel,  
5       date, time and length of the channel of video signals to be  
6       recorded; and

7 generating control commands from said encoded data  
8 for selection of said channel of video signals for recording  
9 and for control of the video cassette recorder to start and  
10 stop the recording of the selected channel by the video  
11 cassette recorder.

1 98. A television calendar for combined visual selection of  
2 programs for direct viewing and for use in automatic recording  
3 of programs for future viewing, the combination comprising:

4 a day section for each of a plurality of calendar  
5 days and, positioned in a predetermined relation with each day  
6 section, an associated unique day visual identifier;

7 a time-of-day section for each of a plurality of  
8 program starting times within each day section and, positioned  
9 in a predetermined relation with each time-of-day section, an  
10 associated unique time-of-day visual identifier;

11 a plurality of unique channel visual identifiers and  
12 corresponding to each such channel visual identifier, a program  
13 identifier within each time-of-day section for such program  
14 that starts at the time of such time-of-day section and that  
15 is associated with the day section and time-of-day section  
16 within which it is positioned; and

17 an additional unique coded indication for each said  
18 program positioned in a predetermined relation to each said  
19 channel visual identifier, the coded indication for each such  
20 program representing the channel, the time-of-day, the calendar  
21 day, and the length of time for the associated program in the  
22 calendar.

1 99. The television calendar of claim 98 wherein at least some  
2 of the unique coded indications comprises a plurality of  
3 digits.

1 100. The television calendar of claim 99 wherein each of the  
2 day, time-of-day and channel identifiers is represented by one  
3 or more digits and wherein the sum of the number of digits of  
4 the unique coded indication is less than the number of digits  
5 in all of the identifiers plus the number of digits  
6 representing the length of time for the associated program.

1 101. A television calendar of claim 98 wherein each of at least  
2 some of said channel visual identifiers comprise a unique cable  
3 channel visual identifier and wherein the television calendar  
4 further comprises an assigned cable channel number positioned  
5 in a predetermined relation to each said cable channel visual  
6 identifier, the assigned cable channel number representing the  
7 cable channel corresponding to said cable channel visual  
8 identifier for said cable television program.

1 102. A method of creating a television calendar for combined  
2 visual selection of programs for direct viewing and for use in  
3 automatic recording of programs for future viewing, comprising  
4 the steps of:

5 creating a day section and an associated unique day  
6 visual identifier for each of a plurality of calendar days;

7 positioning in relation to each of the day sections  
8 the associated day visual identifier;

9 creating a time-of-day section for each day section,  
10 for each of a plurality of television program starting times  
11 and an associated unique time-of-day visual identifier;

12 positioning in relation to each of the time-of-day  
13 sections the corresponding associated unique time-of-day visual  
14 identifier;

15                   creating a plurality of unique channel visual  
16                    identifiers and a corresponding program identifier for each  
17                    such channel visual identifier, within each time-of-day section  
18                    for such program that starts at the time of such time-of-day  
19                    section, and that is associated with the day section and time-  
20                    of-day section within which it is positioned;

21                   creating a unique coded indication for each said  
22                    program, the coded indication representing the channel, the  
23                    calendar day, the time-of-day, and the length of time for said  
24                    program; and

25                   positioning in a predetermined relation to each  
26                    program identifier, the unique coded indication for each said  
27                    program.

1                   103. The method of claim 102 wherein the step of creating a  
2                    unique coded indication for each said program comprises the  
3                    step of:

4                   creating the unique coded indication to have less  
5                    digits than the sum of the number of digits in all of the  
6                    identifiers associated with said program plus the number of  
7                    digits representing the length of time associated with said  
8                    program.

1                   104. The method of claim 102 wherein the step of creating the  
2                    unique coded indication comprises the step of encoding digits  
3                    representing the identifiers based on probabilities as to the  
4                    frequency of occurrence of the identifiers in the calendar.

1                   105. The method of claim 103 wherein the step of creating the  
2                    unique coded indication comprises the step of:

3                   encoding the digits in all of the identifiers  
4                    associated with each said program, plus the digits representing

5 the length of time associated with said program, based on  
6 probabilities assigned to the channel associated with the  
7 channel identifier, calendar day associated with the day  
8 identifier, time-of-day associated with the time-of-day  
9 identifier and length of time associated with said program.

1 106. The method of claim 102 wherein the step of creating a  
2 plurality of unique channel visual identifiers further  
3 comprises the steps of:

4 creating at least some of said channel visual  
5 identifiers to comprise unique cable channel visual  
6 identifiers; and

7 positioning in a predetermined relation to each said  
8 cable channel visual identifier an assigned cable channel  
9 number representing the cable channel corresponding to said  
10 cable channel visual identifier for said cable television  
11 program.

1 107. The method of claim 102 wherein the step of creating a  
2 unique coded indication comprises the steps of:

3 creating a separate representation for each of a  
4 channel, day, time of day and length for any program in the  
5 calendar;

6 using said representation to derive a priority number  
7 for each of said channel, date, time and length  
8 representations;

9 converting the priority numbers into a binary number  
10 for each of said channel, day, time and length commands;

11 reordering the bits of said binary numbers to obtain  
12 a compressed code of binary bits; and

13 converting the compressed code of binary bits into  
14 one said unique coded indication.

1 108. The method of claim 107 wherein the step of reordering  
2 comprises the step of performing said reordering as a function  
3 of a bit hierarchy key.

1 109. The method of claim 107 wherein the step of reordering  
2 comprises the step of performing said reordering as a function  
3 of the output of a clock.

1 110. The method of claim 107 wherein the step of using said  
2 representation to derive a priority number comprises the step  
3 of performing said derivation as a function of the output of  
4 a clock.

1 111. The method of claim 102 wherein the step of creating a  
2 unique coded indication comprises the steps of:

3 creating a separate representation for each of a  
4 channel, day, time of day and length for any program in the  
5 calendar;

6 using said representation to derive a priority number  
7 for each of said channel, date, time and length  
8 representations;

9 converting the priority numbers into a mixed radix  
10 number for each of said channel, day, time and length commands;

11 reordering the bits of said mixed radix numbers to  
12 obtain a compressed code of mixed radix bits; and

13 converting the compressed code of mixed radix bits  
14 into one said unique coded indication.

1 112. A television calendar on a display medium for combined  
2 visual selection of programs for direct viewing and for use in

3        automatic recording of programs for future viewing, the  
4        combination comprising:

5            a day section for each of a plurality of calendar  
6        days and, positioned in a predetermined relation with each day  
7        section, a unique day visual identifier on the display medium;

8            a time-of-day section for each of a plurality of  
9        program starting times within each day section and, positioned  
10      in a predetermined relation with each time-of-day section, a  
11      unique time-of-day visual identifier on the display medium;

12        a plurality of unique channel visual identifiers on  
13      the display medium and corresponding to each such channel  
14      visual identifier a program identifier within each time-of-day  
15      section for such program that starts at the time of such  
16      time-of-day section and that is associated with the day section  
17      and time-of-day section within which it is positioned; and

18        an additional unique coded indication for each said  
19      program positioned on the display medium in a predetermined  
20      relation to each said channel visual identifier, the coded  
21      indication representing the channel, the time-of-day, the  
22      calendar day and the length of time for the associated program  
23      in the calendar.

1        113. The television calendar on a display medium of claim 112  
2        wherein at least some of the unique coded indications comprises  
3        a plurality of digits.

1        114. The television calendar of claim 113 wherein each of the  
2        day, time-of-day and channel identifiers is represented by one  
3        or more digits and wherein the number of digits of the unique  
4        coded indication is less than the sum of the number of digits  
5        in all of the identifiers plus the number of digits  
6        representing the length of time for the associated program.

1 115. A television calendar of claim 112, wherein each of at  
2 least some of said channel visual identifiers comprise a unique  
3 cable channel visual identifier and wherein the television  
4 calendar further comprises an assigned cable channel number  
5 positioned in a predetermined relation to each said cable  
6 channel visual identifier, the assigned cable channel number  
7 representing the cable channel corresponding to said cable  
8 channel visual identifier for said cable television program.

1 116. A method of creating a television calendar on a display  
2 medium for combined visual selection of programs for direct  
3 viewing and for use in automatic recording of programs for  
4 future viewing, comprising the steps of:

5 creating on the display medium a day section and an  
6 associated unique day visual identifier for each of a plurality  
7 of calendar days;

8 positioning on the display medium in relation to the  
9 day section the associated day visual identifier;

10 creating on the display medium a time-of-day section  
11 and an associated unique time-of-day visual identifier, within  
12 each day section, for each of a plurality of television program  
13 starting times;

14 positioning on the display medium in relation to the  
15 time-of-day section the associated unique time-of-day visual  
16 identifier;

17 creating on the display medium a plurality of unique  
18 channel visual identifiers and a corresponding program  
19 identifier to each such channel visual identifier, within each  
20 time-of-day section for such program that starts at the time  
21 of such time-of-day section, and that is associated with the

22 day section and time-of-day section within which it is  
23 positioned;

24 creating on the display medium a unique coded  
25 indication for each said program, the coded indication  
26 representing the channel, the calendar day, the time-of-day,  
27 and the length of time for said program; and

28 positioning in a predetermined relation to each said  
29 channel visual identifier, the unique coded indication for each  
30 said program.

1 117. The method of claim 116 wherein the step of creating on  
2 a display medium a unique coded indication for each said  
3 program comprises the step of:

4 creating the unique coded indication to have less  
5 digits than the sum of the number of digits in all of the  
6 identifiers associated with said program plus the number of  
7 digits representing the length of time associated with said  
8 program.

1 118. The method of claim 117 wherein the step of creating the  
2 unique coded indication to have less digits comprises the step  
3 of:

4 encoding the digits in all of the identifiers  
5 associated with said program, plus the digits representing the  
6 length of time associated with said program, based on  
7 probabilities assigned to the channel associated with the  
8 channel identifier, calendar day associated with the day  
9 identifier, time-of-day associated with the time-of-day  
10 identifier, and length of time associated with said program.

1 119. The method of claim 116 wherein the step of creating on  
2 a display medium a plurality of unique channel visual  
3 identifiers further comprises the steps of:

4 creating on a display medium at least some of said  
5 channel visual identifiers to comprise unique cable channel  
6 visual identifiers;

7 positioning on a display medium in a predetermined  
8 relation to each said cable channel visual identifier an  
9 assigned cable channel number representing the cable channel  
10 corresponding to said cable channel visual identifier for said  
11 cable television program.

1 120. The method of encoding a set of variables comprising the  
2 steps of:

3 entering an input value for each variable;  
4 providing a priority vector table for each variable  
5 wherein the priority vector table for each variable lists every  
6 possible value of the variable in the order of its relative  
7 priority and assigns a unique priority number;

8 performing a table look up in said priority vector  
9 table on said input value for each variable to find its unique  
10 priority number;

11 converting each said unique priority number for said  
12 input value for each variable to a binary number and  
13 concatenating the resulting binary numbers to form one long  
14 binary number;

15 providing a binary bit hierarchy key arranged in the  
16 order of highest differential probability to least differential  
17 probability of the combination of bits representing all the  
18 variables, wherein the differential probability is a measure  
19 of the relative importance of a bit from one variable over a

20        bit from another variable in minimizing the length of codes  
21        which are most often used;

22                reordering all bits in said one long binary number  
23        according to the order of said binary bit hierarchy key to form  
24        a compressed code.

1        121. An apparatus for using compressed codes for recorder  
2        preprogramming that comprises:

3                means for entering and transmitting a compressed  
4        code;

5                means for receiving a command signal coupled to said  
6        means for entering and transmitting a compressed code entry;

7                means for command control electrically coupled to  
8        said means for receiving a command signal;

9                a means for keeping time electrically coupled to said  
10      means for command control;

11                means for decoding a compressed code having at least  
12      one digit into channel, date, time and length commands  
13      electrically coupled to said means for command control;

14                means for recording coupled to said means for command  
15      control;

16                means for turning said means for recording ON and OFF  
17      in response to comparison of said decoded date, time and length  
18      commands from said means for command control with said means  
19      for keeping time; and

20                means for tuning channels electrically coupled to a  
21      signal input and to said means for recording and to said means  
22      for command control and responsive to decoded channel commands  
23      to tune to selected channels from said means for command  
24      control.

1       122. The apparatus for using compressed codes for recorder  
2       preprogramming of claim 121 wherein:

3                said means for keeping time is electrically coupled  
4       to said means for decoding a compressed code into channel,  
5       date, time and length commands; and

6                wherein the decoding of a compressed code by said  
7       means for decoding a compressed code into channel, date, time  
8       and length commands is a function of said means for keeping  
9       time.

1       123. The apparatus for using compressed codes for recorder  
2       preprogramming of claim 122 which further comprises:

3                means coupled to said means for command control for  
4       daily using said channel, date, time and length (CDTL) commands  
5       decoded from said compressed code wherein the start date is the  
6       date specified in said channel, date, time and length (CDTL)  
7       commands for recording a program daily.

1       124. The apparatus for using compressed codes for recorder  
2       preprogramming of claim 122 which further comprises:

3                means coupled to said means for command control for  
4       weekly using said channel, date, time and length (CDTL)  
5       commands decoded from said compressed code wherein the start  
6       date is the date specified in said channel, date, time and  
7       length (CDTL) commands for recording a program weekly.

1       125. The apparatus for using compressed codes for recorder  
2       preprogramming of claim 123 or 124 wherein said means for  
3       entering and transmitting a compressed code comprises:

4           means for remote control having a signal transmit  
5    means coupled to said means for command control receiver; and  
6           means for compressed code entry electrically coupled  
7    to said means for remote control.

1       126. The apparatus for using compressed codes for recorder  
2    preprogramming of claim 123 or 124 wherein said means for  
3    entering and transmitting a compressed code comprises:

4           means for manual control electrically coupled to said  
5    means for a command signal receiver; and  
6           means for compressed code entry means electrically  
7    coupled to said means for manual control.

1       127. An apparatus for using compressed codes for recorder  
2    preprogramming for a recorder that comprises:

3           means for remote control having a means for  
4    transmitting signals;

5           means for compressed code entry electrically coupled  
6    to said means for remote control;

7           means for decoding a compressed code having at least  
8    one digit into channel, date, time and length commands  
9    electrically coupled to said means for transmitting signals on  
10   said remote control;

11           means for receiving a command signal coupled to said  
12    means for transmitting signals;

13           means for command control for controlling a recorder  
14    electrically coupled to said means for receiving a command  
15    signal;

16 a first means for keeping time electrically coupled  
17 to said means for command control;

18 means for recording coupled to said means for  
19 command control;

20 means for turning said means for recording ON and OFF  
21 in response to comparison of said decoded date, time and length  
22 commands from said means for command control with said first  
23 means for keeping time; and

24                   means for tuning channels electrically coupled to a  
25                   signal input and to said means for recording and to said means  
26                   for command control and responsive to decoded channel commands  
27                   to tune to selected channels from said means for command  
28                   control.

1 128. The apparatus for using compressed codes for recorder  
2 preprogramming of claim 127 which further comprises:

means coupled to said command controller for daily using said channel, date, time and length (CDTL) commands decoded from said compressed code wherein the start date is the date specified in said channel, date, time and length (CDTL) commands for recording a program daily.

1 129. The apparatus for using compressed codes for recorder  
2 preprogramming of claim 127 which further comprises:

means coupled to said command controller for weekly using said channel, date, time and length (CDTL) commands decoded from said compressed code wherein the start date is the date specified in said channel, date, time and length (CDTL) commands for recording a program weekly.

1 130. The apparatus for using compressed codes for recorder  
2 preprogramming of claim 127, 128 or 129 that further comprises:

3 a second means for keeping time electrically coupled  
4 to said means for decoding a compressed code into channel,  
5 date, time and length commands;

6 wherein the decoding of a compressed code by said  
7 means for decoding a compressed code into channel date time and  
8 length commands is a function of said second means for keeping  
9 time.

1 131. An apparatus for using compressed codes for recorder  
2 preprogramming for a recorder that comprises:

3 means for universal remote control having a means for  
4 transmitting signals and a means for receiving signals;

5 a learn switch electrically coupled to said means for  
6 universal remote control wherein when said learn switch is "ON"  
7 said means for universal remote control can learn another  
8 remote controller functions via said means for receiving  
9 signals;

10 means for compressed code entry electrically coupled  
11 to said means for universal remote control;

12 means for decoding a compressed code having at least  
13 one digit into channel, date, time and length commands  
14 electrically coupled to said means for transmitting signals on  
15 said universal remote control;

16 means for receiving a command signal coupled to said  
17 means for transmitting signals;

18           means for command control for controlling a recorder  
19        electrically coupled to said means for receiving a command  
20        signal;

21           a first means for keeping time electrically coupled  
22        to said means for command control;

23           means for recording coupled to said means for command  
24        control;

25           means for turning said means for recording ON and OFF  
26        in response to comparison of said decoded date, time and length  
27        commands from said means for command control with said first  
28        means for keeping time; and

29           means for tuning channels electrically coupled to a  
30        signal input and to said means for recording and to said means  
31        for command control and responsive to decoded channel commands  
32        to tune to selected channels from said means for command  
33        control.

1       132. The apparatus for using compressed codes for recorder  
2        preprogramming of claim 131 which further comprises:

3           means coupled to said command controller for daily  
4        using said channel, date, time and length (CDTL) commands  
5        decoded from said compressed code wherein the start date is the  
6        date specified in said channel, date, time and length (CDTL)  
7        commands for recording a program daily.

1       133. The apparatus for using compressed codes for recorder  
2        preprogramming of claim 131 which further comprises:

3           means coupled to said command controller for weekly  
4        using said channel, date, time and length (CDTL) commands

5        decoded from said compressed code wherein the start date is the  
6        date specified in said channel, date, time and length (CDTL)  
7        commands for recording a program weekly.

1        134. The apparatus for using compressed codes for recorder  
2        preprogramming of claim 131, 132 or 133 that further comprises:

3                a second means for keeping time electrically coupled  
4        to said means for decoding a compressed code into channel,  
5        date, time and length commands; and

6                wherein the decoding of a compressed code by said  
7        means for decoding a compressed code into channel, date, time  
8        and length commands is a function of said second means for  
9        keeping time.

1        135. The method of controlling a television controller for  
2        selecting a cable channel for viewing, the steps comprising:

3                providing a television calendar with assigned cable  
4        channel number identifiers associated with each cable channel;

5                providing a television controller having a cable  
6        channel address table with memory for a set of assigned cable  
7        channel numbers and a corresponding set of local cable carrier  
8        channel numbers and having the capability to convert an  
9        assigned cable channel number into a local cable carrier  
10      channel number by using said cable channel address table;

11      setting up said cable channel address table with said  
12      set of assigned cable channel numbers and said corresponding  
13      set of local cable carrier channel numbers;

14      entering an assigned cable channel number identifier  
15      corresponding to a cable channel selected for viewing; and

16 conversion of said assigned cable channel number  
17 identifier into a corresponding local cable carrier channel  
18 number by said television controller.

1 136. The apparatus for using compressed codes for recorder  
2 preprogramming of claim 121 wherein:

3 said means for decoding a compressed code having at  
4 least one digit into channel, date, time and length information  
5 electrically coupled to said means for command control further  
6 comprises a means for detecting that said channel information  
7 corresponds to an assigned cable channel number; and

8 said means for command control further comprises a  
9 means for converting an assigned cable channel number into a  
10 local cable carrier channel number.

1 137. The apparatus for using compressed codes for recorder  
2 preprogramming of claim 127 or 131 wherein said means for  
3 decoding a compressed code having at least one digit into  
4 channel, date, time and length commands further comprises:

5 a means for detecting that said channel commands  
6 corresponds to an assigned cable channel number; and

7 a means for converting an assigned cable channel  
8 number into a local cable carrier channel number.

1 138. The apparatus for using compressed codes for recorder  
2 preprogramming of claim 127 or 131 that further comprises:

3 a stack memory coupled to said means for decoding a  
4 compressed code for storing a plurality of programs consisting

5 of channel, date, time and length commands for timer  
6 preprogramming;

7 a second means for keeping time electrically coupled  
8 to said means for decoding a compressed code into channel,  
9 date, time and length commands; and

10 wherein said means for decoding a compressed code  
11 further comprises a means for periodically comparing said date  
12 and time commands from said stack memory and transmitting said  
13 channel, date, time and length commands to said means for  
14 receiving a command signal when said date and time commands  
15 compare with said second means for keeping time.

1 139. The method of permitting a large number of programs to  
2 be timer preprogrammed for recording by a video cassette  
3 recorder for time shifted viewing where the video cassetter  
4 recorder can store only N timer preprogrammed programs, the  
5 steps comprising:

6 providing a remote controller having a means for  
7 keeping time;

8 entering into said remote controller compressed codes  
9 each having at least one digit and each representative of, and  
10 compressed in length from, the combination of channel, time-  
11 of-day, day and length commands for a program; and

12 decoding each compressed code having at least one  
13 digit to channel, time-of-day, day and length commands;

14 providing a memory;

15 entering each said channel, time-of-day, day and  
16 length commands into said memory;

17 reordering said channel, time-of-day, day and length  
18 commands in said memory into temporal order; and

19                   testing whether first N entries in said memory have  
20                   changed and if yes, sending changed entries in first N entries  
21                   to said video cassette recorder.

1           140. The method of permitting a large number of programs to  
2           be timer preprogrammed of claim 139, the steps further  
3           comprising:

4                   periodically checking whether stop time of Nth entry  
5                   of said first N entries in memory has passed; and

6                   if stop time of Nth entry has passed and number of  
7                   entries in memory is greater than N, then turning on a means  
8                   for alerting a user to activate remote controller to send more  
9                   programs to said video cassette recorder and once remote  
10                  controller is activated, setting next N entries in said memory  
11                  to be the first N entries in said memory and sending said first  
12                  N entries to said video cassette recorder and turning off said  
13                  means for alerting a user.

1           141. An apparatus for using compressed codes for recorder  
2           preprogramming that comprises:

3                   means for remote control having a means for  
4                   transmitting signals;

5                   means for compressed code entry electrically coupled  
6                   to said means for remote control;

7                   means for decoding a compressed code having at least  
8                   one digit into channel, date, time and length commands  
9                   electrically coupled to said means for remote control;

10                  means for storing said channel, date, time and length  
11                  commands in said remote control;

12                  a means for keeping time electrically coupled to said  
13                  means for remote control;

14                   means for command control electrically coupled to  
15    said means for remote control;  
16                   means for recording coupled to said command control;  
17    and  
18                   wherein said means for command control compares the  
19    stored  
20    date, time and length commands to said means for keeping time  
21    and sends at the appropriate time, record ON and OFF commands  
22    and channel select commands to a means for recording via said  
23    transmit signals from said means for remote control.

1    142. The apparatus for using compressed codes for recorder  
2    preprogramming of claim 141 that further comprises:

3                   means for storing a plurality of protocol sets of  
4    transmit signals for commands for varying models of said means  
5    for recording electrically coupled to said means for remote  
6    control; and

7                   means for selecting for a particular means for  
8    recording a protocol set of transmit signals for sending  
9    commands.

1    143. The apparatus for using compressed codes for recorder  
2    preprogramming of claim 141 wherein:

3                   said means for remote control is a universal remote  
4    controller and can learn a protocol of the transmit signals for  
5    sending commands to a particular model of a means for  
6    recording.

1       144. The system of claim 73 wherein said decoder further  
2       comprises:

3               means for detecting that said binary channel priority  
4       number contains a set cable channel bit indicating an assigned  
5       cable channel priority number; and

6               means for using said detected assigned priority cable  
7       channel priority number to derive a corresponding local cable  
8       channel command.

1       145. The method of claim 91 wherein the step of decoding and  
2       expanding further comprises the steps of:

3               detecting that said binary channel priority number  
4       contains a set cable channel bit indicating an assigned cable  
5       channel priority number; and

6               using said detected assigned priority cable channel  
7       priority number to derive a corresponding local cable channel  
8       command.

1       146. The method of claim 106 wherein the step of creating a  
2       unique coded indication comprises steps of:

3               using said representation to derive a priority number  
4       for each of said channel, date, time and length  
5       representations;

6               converting the priority numbers into a binary number  
7       for each of said channel, day, time and length commands;

8               adding a cable channel bit set to "1" if said  
9       representation is for a cable channel;

10               reordering the bits of said binary numbers to obtain  
11       a compressed code of binary bits; and

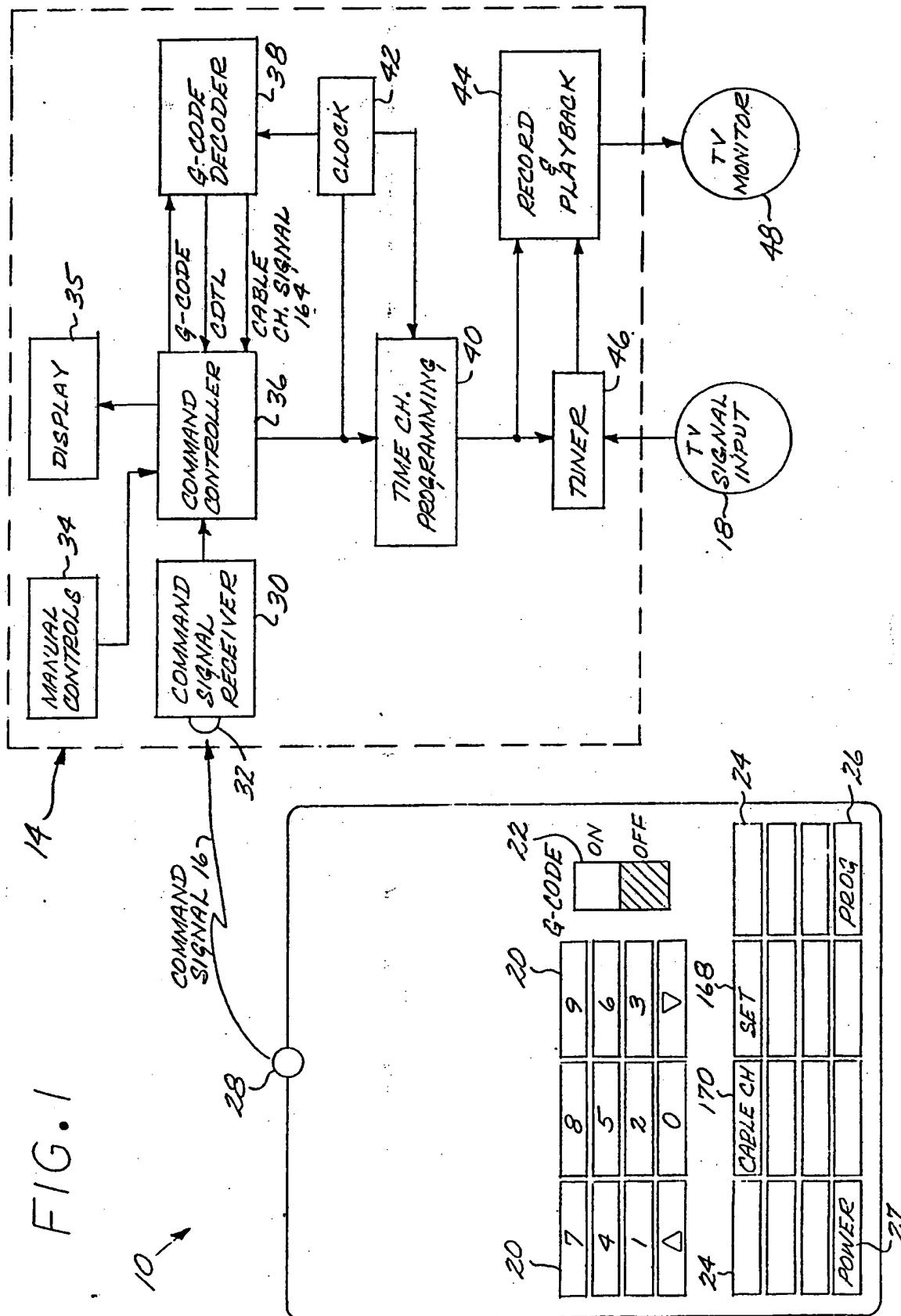
12                   converting the compressed code of binary bits into  
13                   one said unique coded indication.

**STATEMENT UNDER ARTICLE 19**

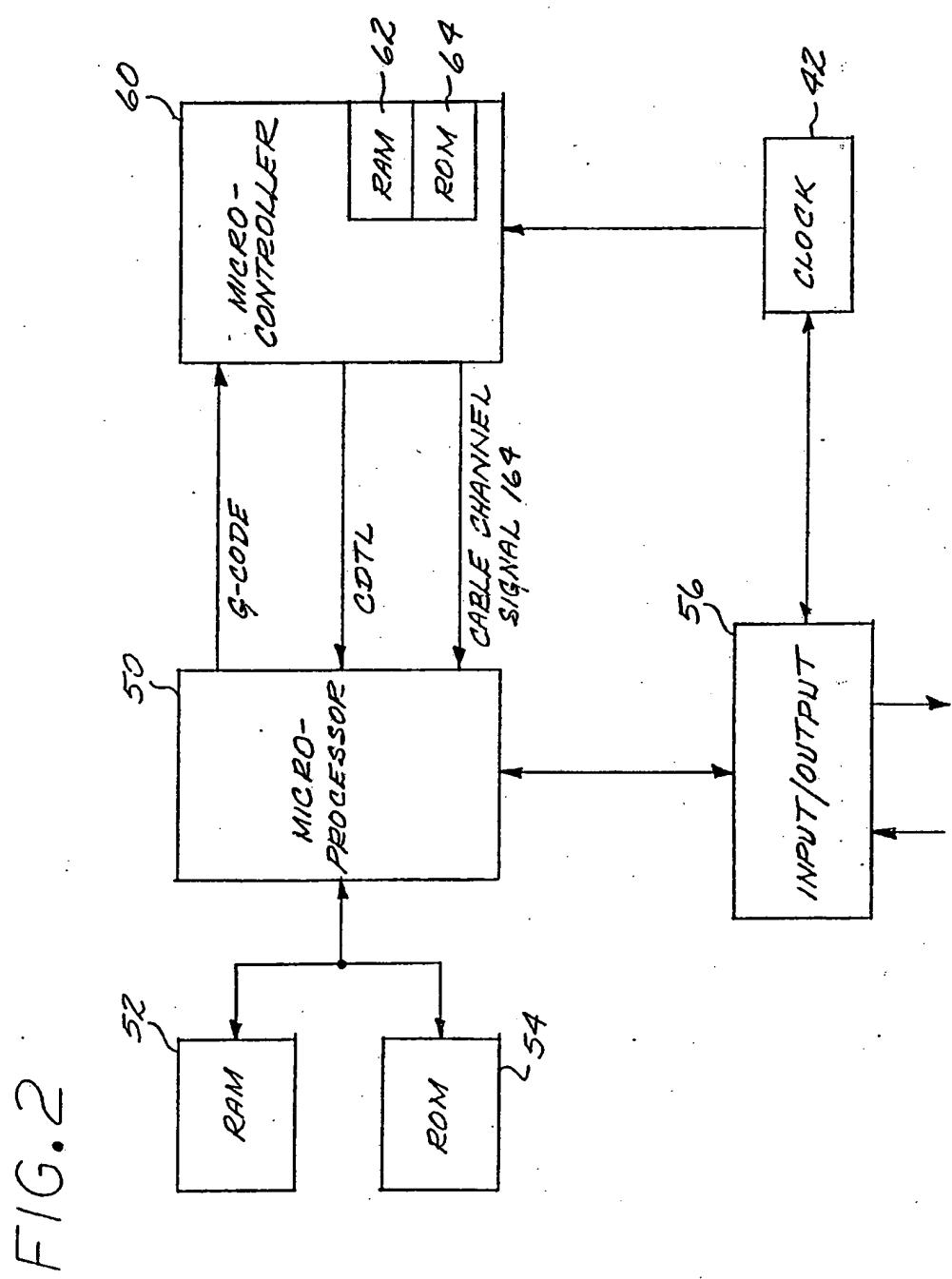
Applicant requests that the following Preliminary Amendment be entered for the subject application. The title is changed to be more descriptive. Minor corrections are made in the description and the drawings, which do not add new matter. All the present claims are cancelled and new claims are submitted.

Replacement pages are attached at the end of this preliminary amendment for pages 1, 3, 4, 6, 8, 11, 12, 20, 25, 28, 29, and 31 of the description, as well as replacement pages for FIGS 1, 2, 3, 4, 8, and 12. Pages 36 to 61, which contain claims 1 - 59 are cancelled.

1 of 13



2 of 13



3 of 13

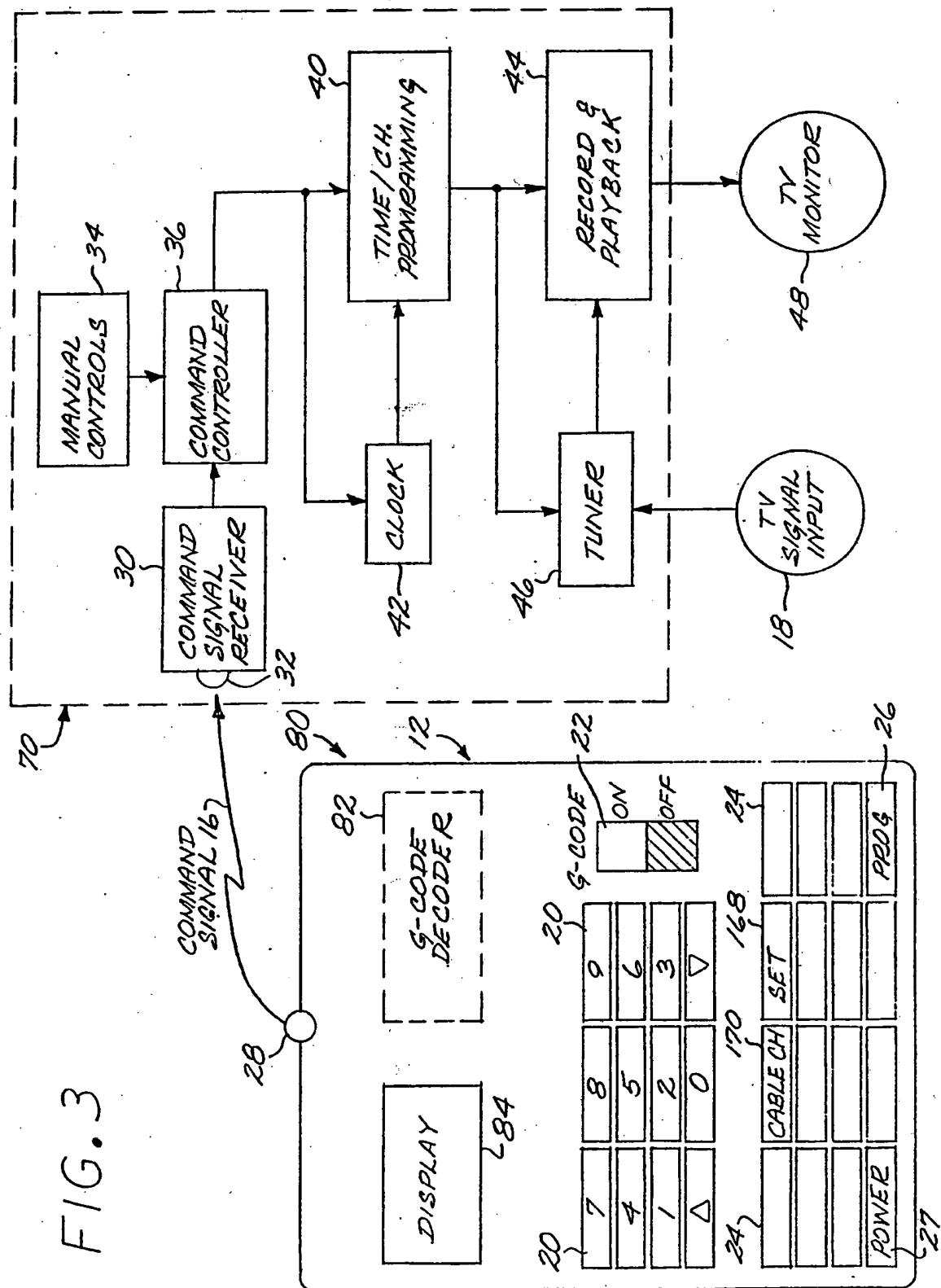


FIG. 4

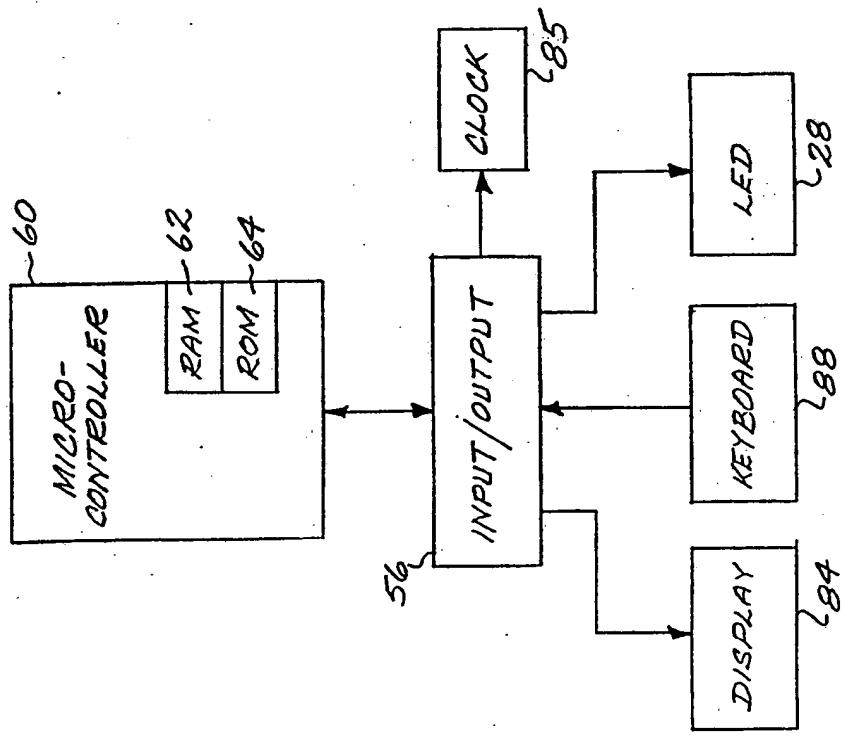
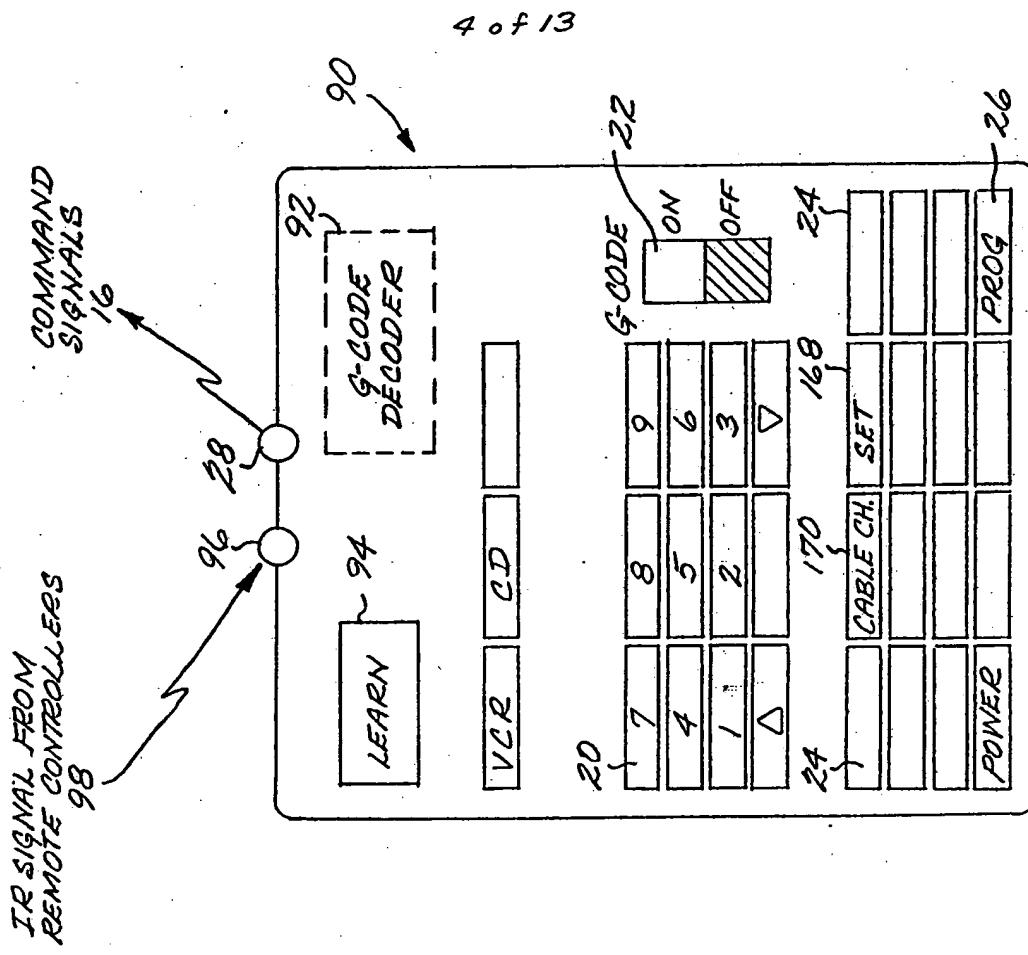
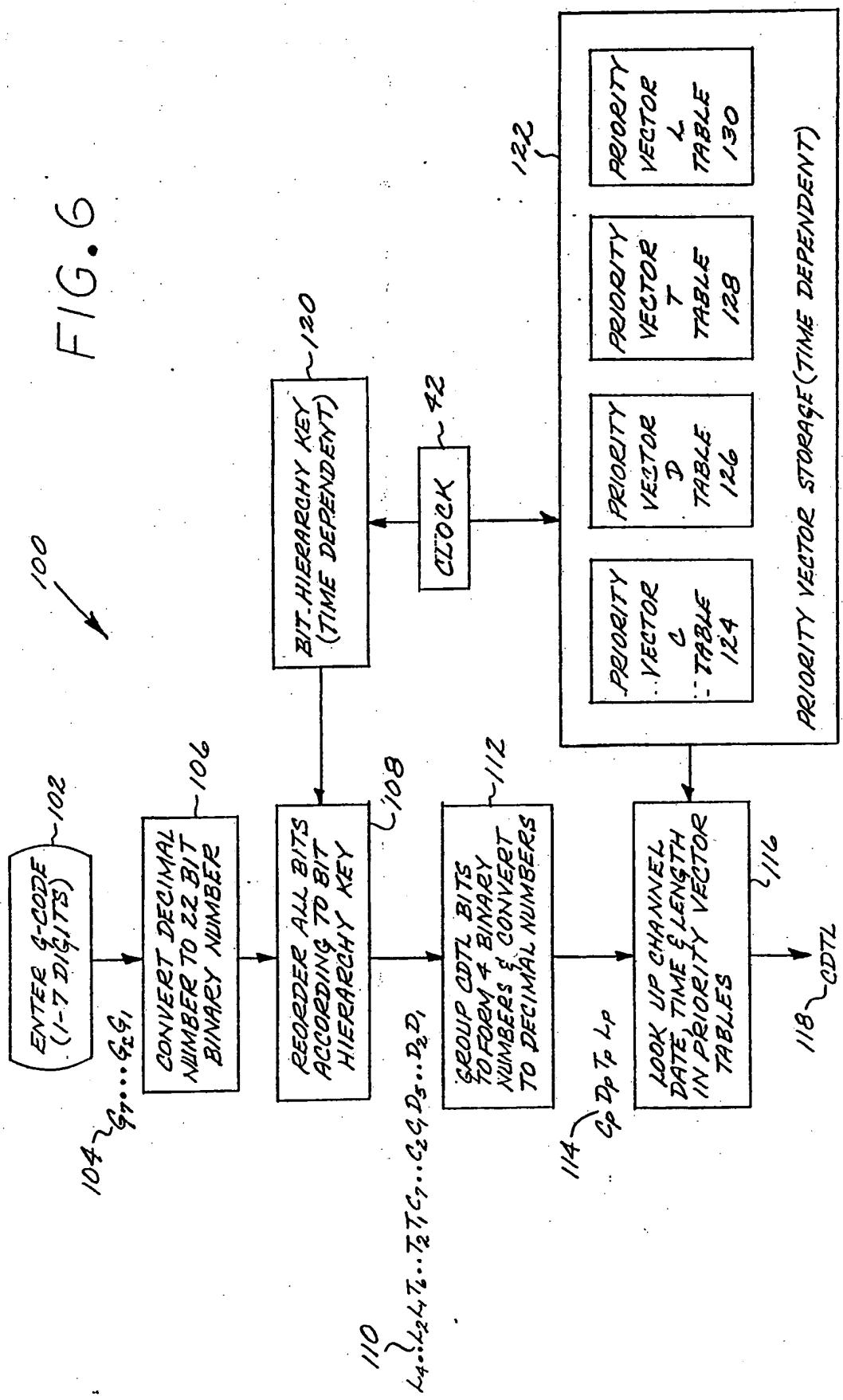


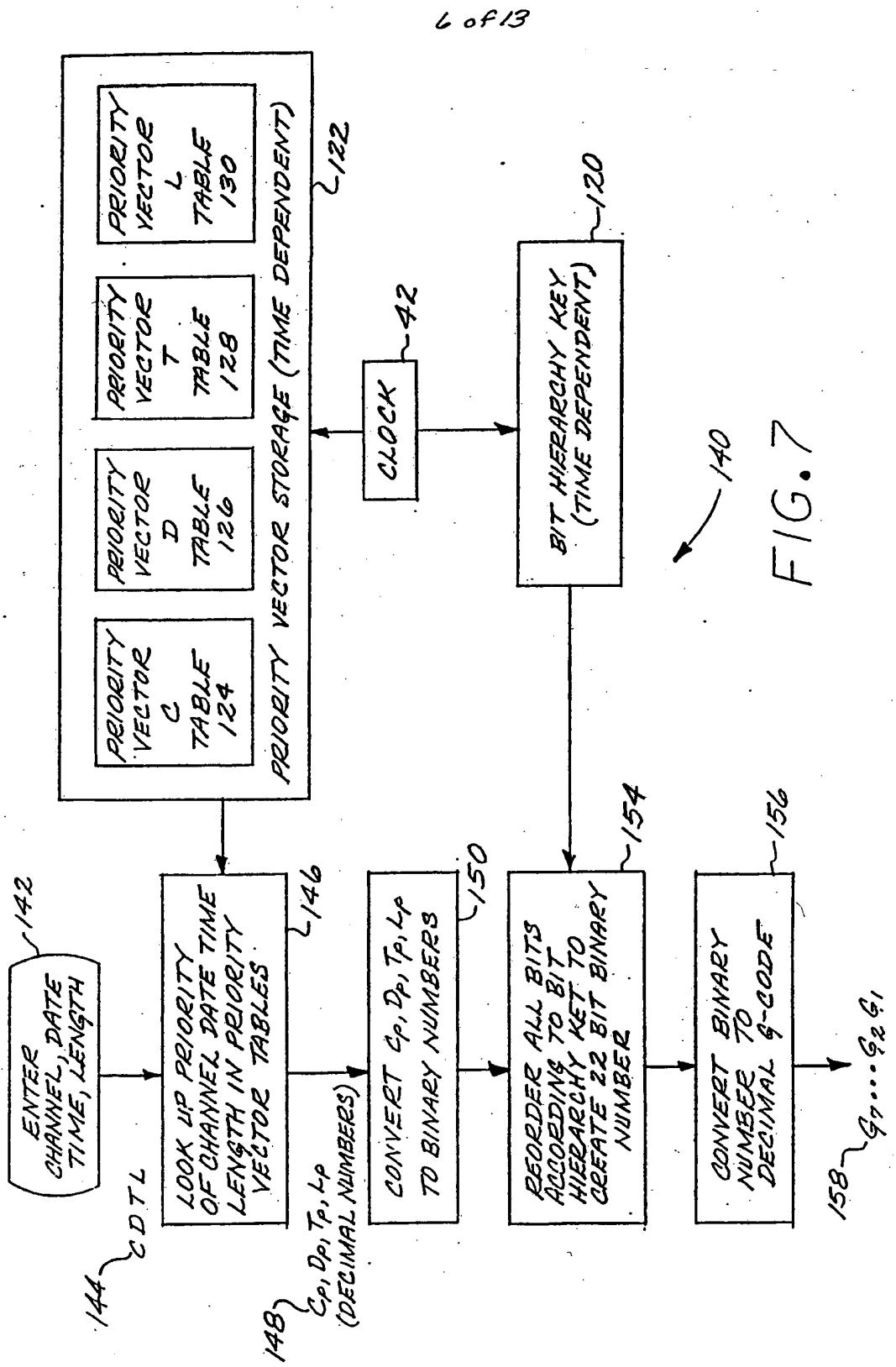
FIG. 5



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FIG. 6





Thursday 202

6PM February 9, 1989-202

WO 90/07844

PCT/US89/05806

7PM

February 9, 1989-202

clever to be outsmarted, the family devises an elaborate joke to play on him.

(18) SPORTS RETROSPECTIVE; 60 Min. [68713]

206

6:30 (11) FAMILY TIES (CC)--Comedy [15657]

206 Mallory's reunion with her college boy friend

(24) NATURESCENE [5321]

206

(John Dukakis) has her worried that she may

not be as interesting to him as she once was.

(20) A visit to the Colorado National Monument

206

near Grand Junction, where wildflowers, in-

sects and birds are observed.

(34) (52) NOTICIAS [62921] [496649]

206

40 DWIGHT THOMPSON--Religion; [68553]

50 HUMANITIES THROUGH THE ARTS [493065]

56 BEVERLY HILLBILLIES--Comedy [496777]

58 Con man Shifty Shafer (Phil Silvers) meets

Jed in the Ozarks. Jed: Buddy Ebsen.

(C15) (A&E) BARRY DOUGLAS--Music; 90 min. [37897]

(C8) (DIS) MOVIE--Drama; 70 min. [23627113]

"The Return of the Big Cat."

(C16) (DISC) BEYOND 2000--Magazine; 60 min. [5289]

(C1) (ESPN) COLLEGE BASKETBALL (32009)

206 North Carolina at North Carolina State. Caroli-

na defeated the Wolfpack 84-81 on Jan. 21. /88

Carters masquerade as a traitor may be

steve Bucknall and Kevin Madden combined

three-point shot as time expired. (Live)

[Time approximate.]

(C2) (HBO) MOVIE(CC)--Science Fiction; (32041)

1hr., 50 min.

"Batteries Not Included."

(C6) (MAX) MOVIE--Documentary; 85 min. (34089)

206

"Sign o' the Times."

(C14) (NIK) MR. WIZARD'S WORLD (CC)--Science (7145)

206

(C17) (PT) NHL HOCKEY (37961)

206 Los Angeles Kings at Boston Bruins, aired on

a 90-minute tape delay.

(C10) (TMC) MOVIE--Comedy; 1hr., 35 min.

"Back Roads." (11828777)

(C7) (USA) SHE-RA: PRINCESS OF POWER (3401)

--Cartoon

206

7 of 13

(C19) (WOR) UNTOUCHABLES--Drama BW; 60 min. (5385)

(11) FAMILY TIES (CC)--Comedy [15657]

(John Dukakis) has her worried that she may not be as interesting to him as she once was.

(13) GIMME A BREAK--Comedy [15593]

Nell (Nell Carter) receives an inheritance and insists on sharing it with everyone--that is, until the check bounces. Addy: Thelma Hopkins

(24) FALL AND RISE OF REGINALD PERRIN

--Comedy [19401]

Something is lacking in the dinner party Reggie has for his boss--specifically, the food.

(28) Mac NEIL, LEHRER NEWSOUR: [78729]

(34) NOTICIERO UNIVISION-Ramos/Salinas [77001]

(50) BUONGIORNA ITALIA!-Instruction [507145]

(52) NOTICIERO TELEMUNDO/CNN [510729]

(56) HOGAN'S HEROES-Comedy [510857]

Carters masquerade as a traitor may be kaput: a lovely Fraulein is trying to poison him.

(C14) (NIK) DOUBLE DARE-Game (29225)

(C11) (TNN) VIDEOCOUNTRY (29129)

(C) (USA) CARTOON EXPRESS (23561)

(7PM) (5) CHARLES IN CHARGE (CC) - Comedy [1065]

While planning a pizza-parlor party, Charles alienates the Powell children by dismissing their suggestions about organizing the event.

(6) FAMILY TIES (CC)-Comedy [1225]

The family's cousin June (Danielle Von Zerneck) stops by to tell them about her trip to Europe--but instead reminiscences about the past visits with the Keatons. Alex: Michael J. Fox.

(7) (T) ABC NEWS (CC)

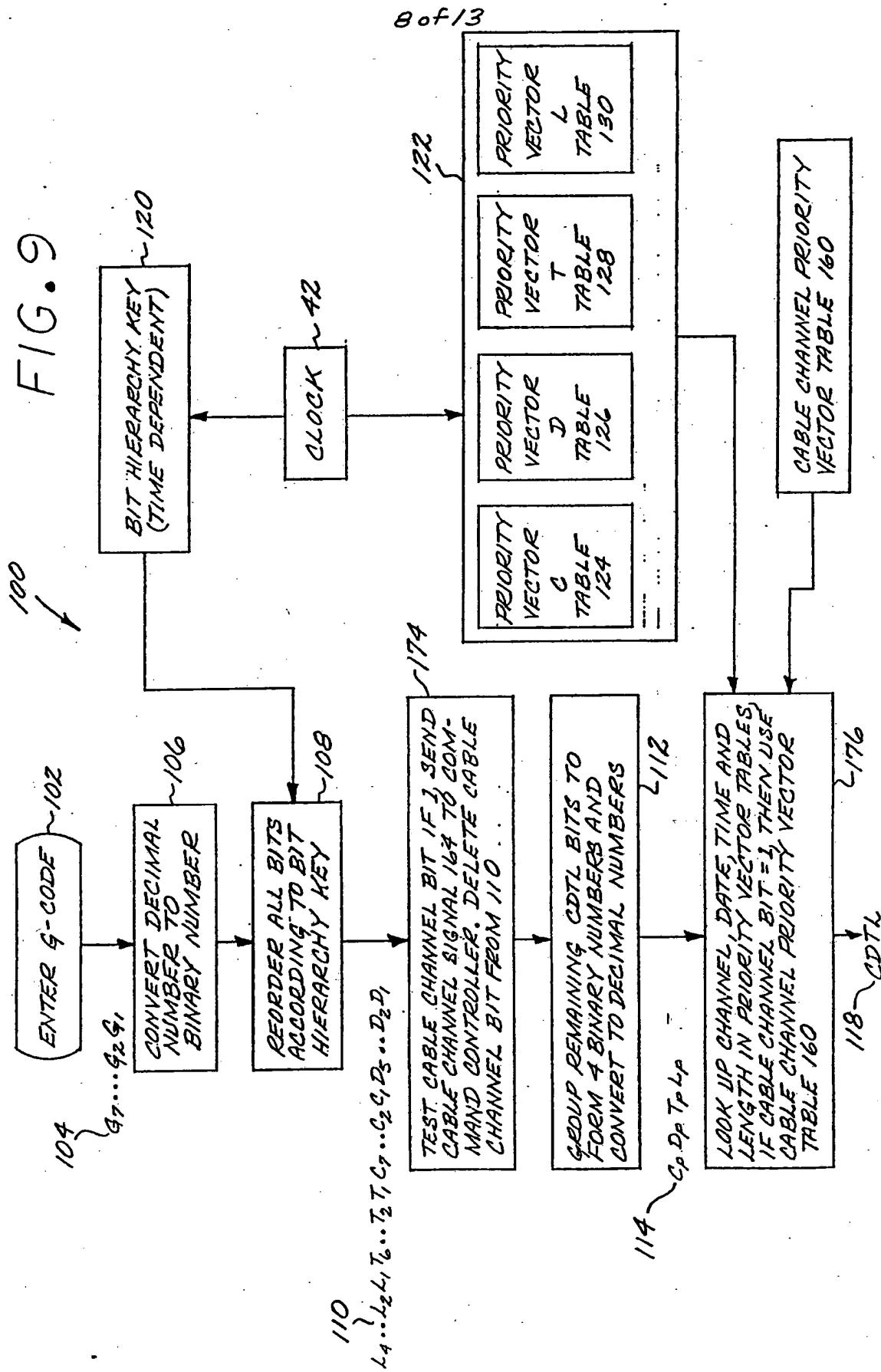
(9) LOVE CONNECTION-Game [4841]

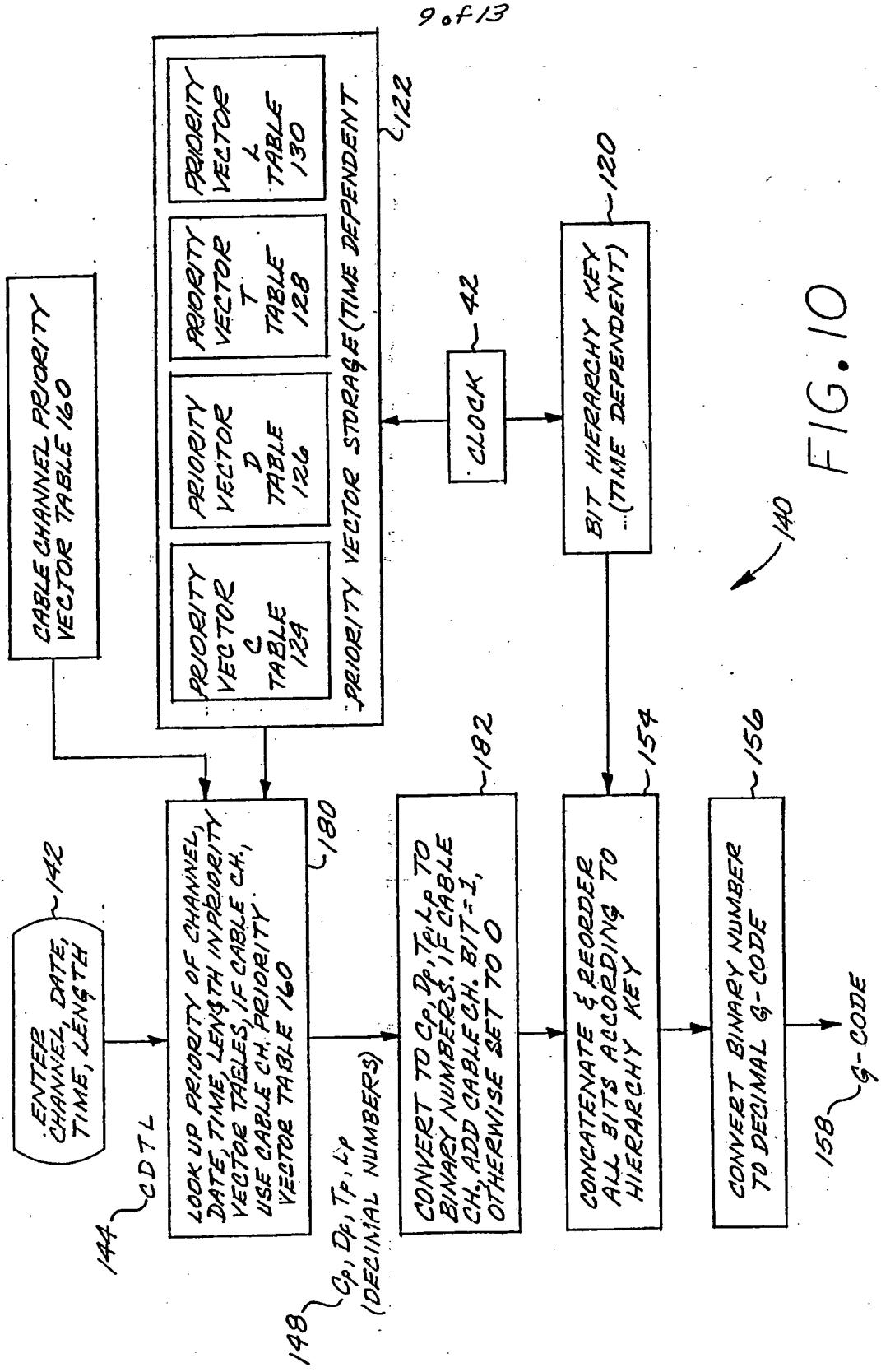
(1) M\*A\*S\*H [11257]

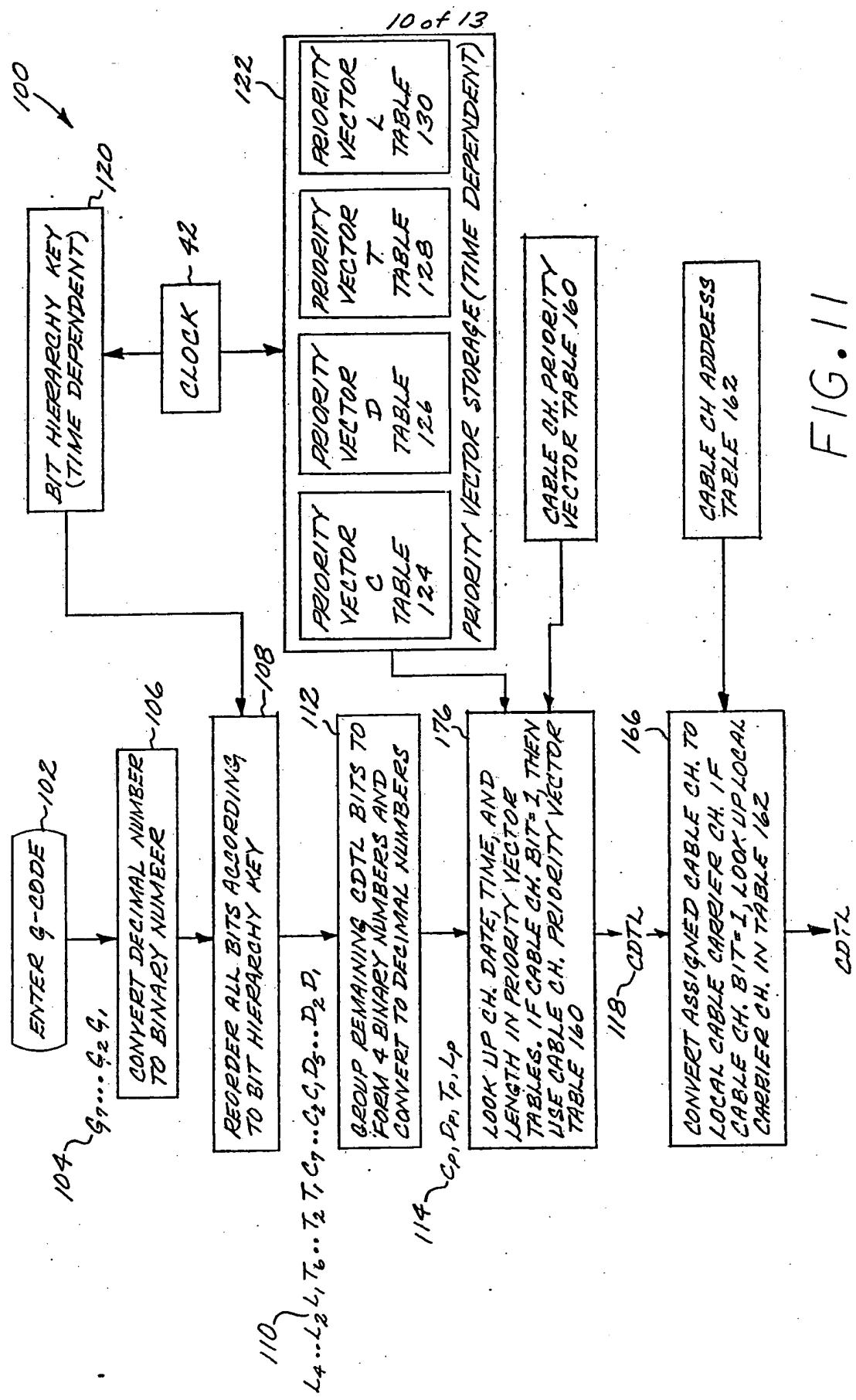
200

F/G. 8

FIG. 9







11 of 13

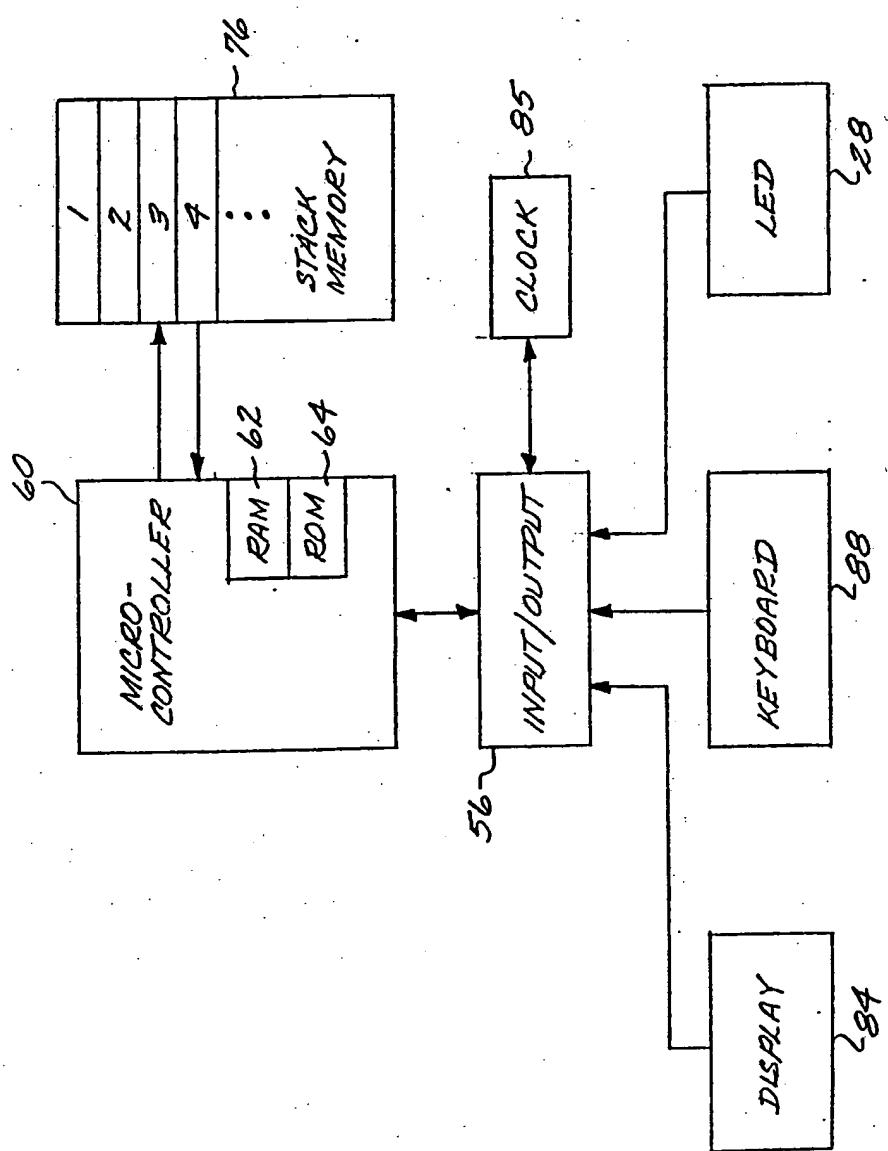


FIG. 12

12 of 13

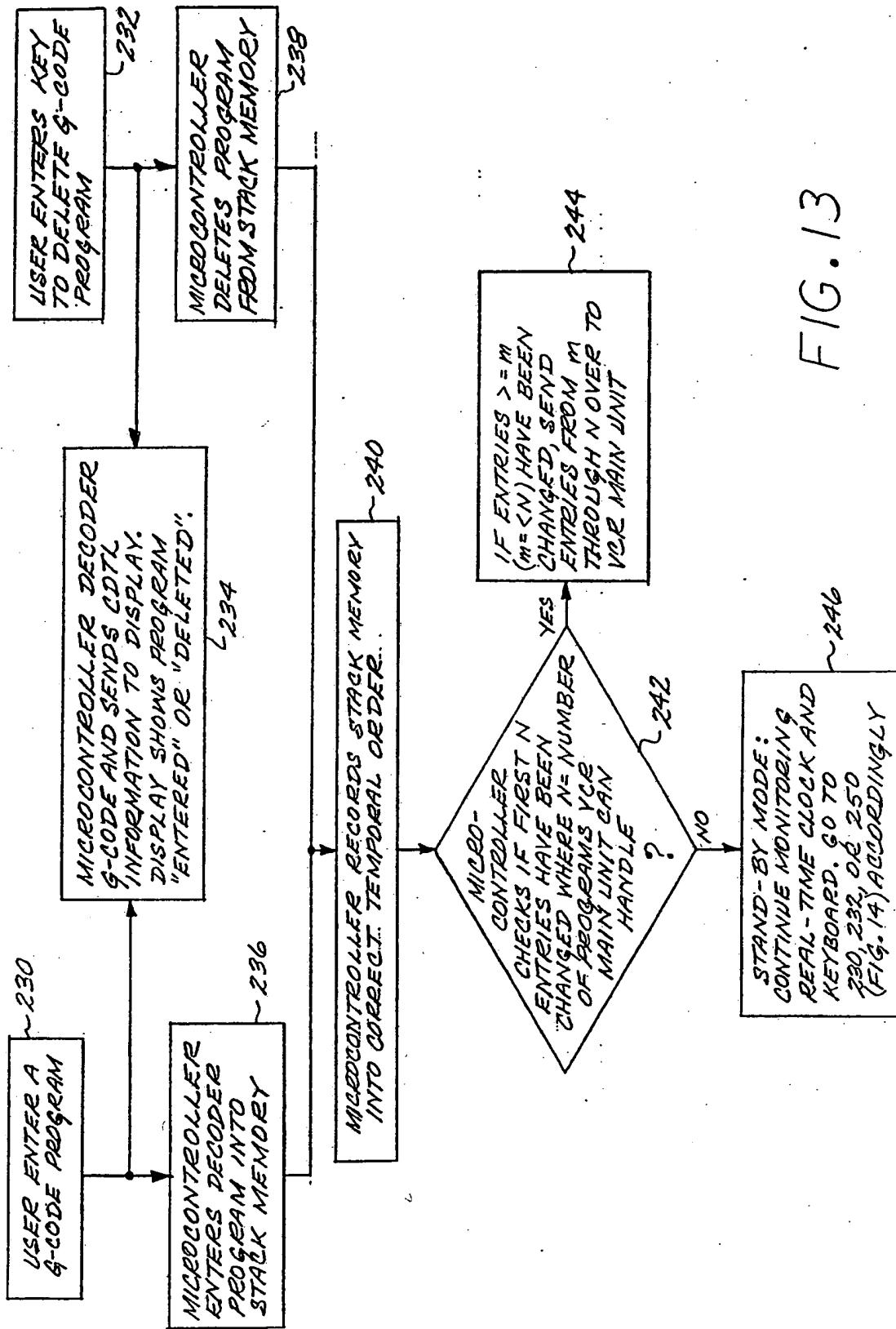


FIG. 13

13 of 13

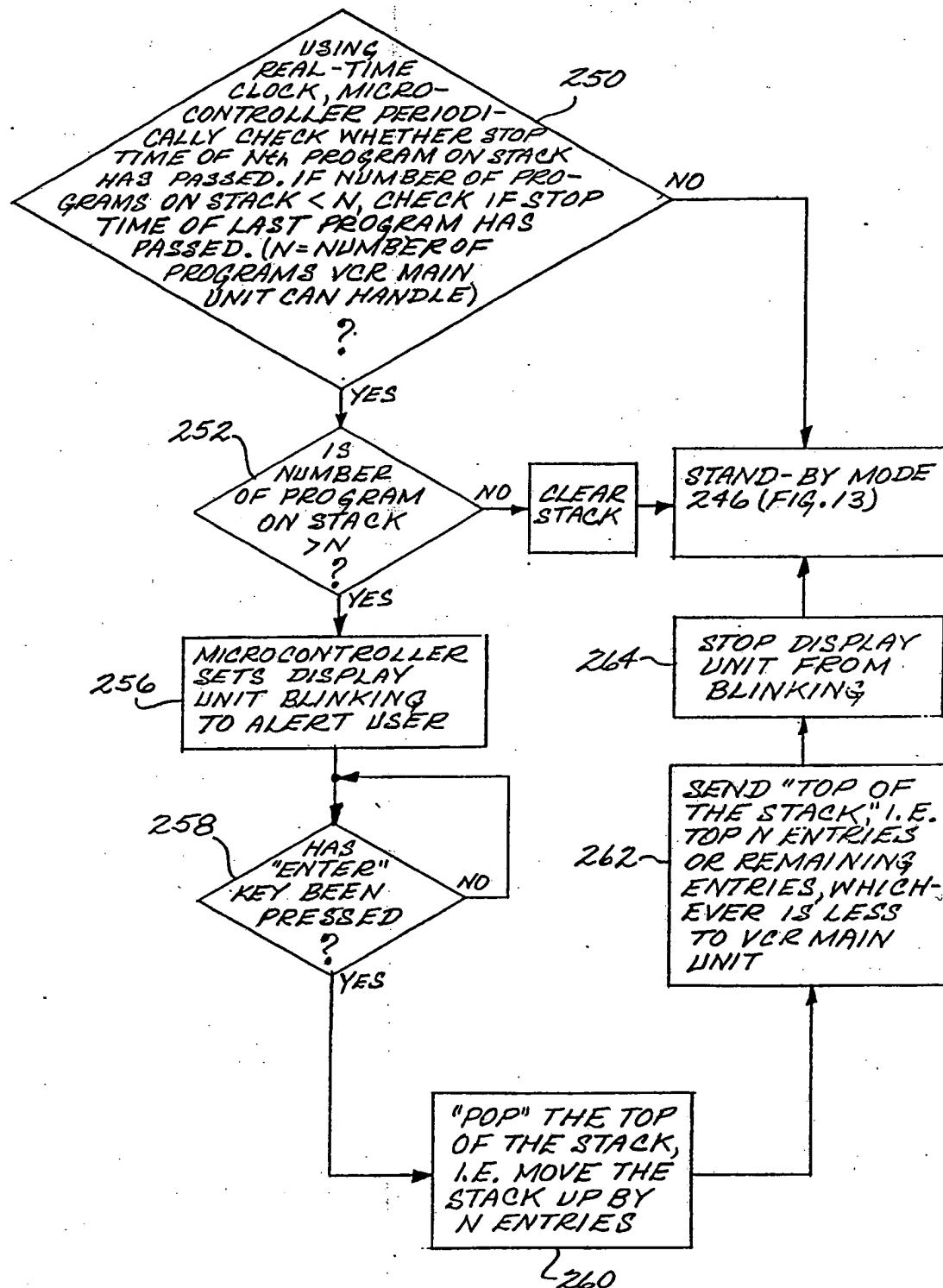


FIG. 14

# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US89/05806

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC (5) : HO4N 5/782		
U.S. Cl : 358/335		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
U.S.	358/191.1,335	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>9</sup>		
Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
P,A	US,A 4,755,883 (UEHIRA) 05 July 1988 See Column 1, Lines 40-60.	1-59
A	US,A 4,475,153 (KIHARA ET AL) 02 October 1984 See Column 1 Lines 64-68 and Column 2 Lines 1-42.	1-59
<p>* Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
04 MAY 1990	21 MAY 1990	
International Searching Authority	Signature of Authorized Officer	
ISA/US	<i>Robert L. Richardson</i> Robert L. Richardson	

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :  H04N 5/782		A1	(11) International Publication Number: WO 90/07844  (43) International Publication Date: 12 July 1990 (12.07.90)								
<p>(21) International Application Number: PCT/US89/05806</p> <p>(22) International Filing Date: 16 December 1989 (16.12.89)</p> <p>(30) Priority data: 289,369 23 December 1988 (23.12.88) US 371,054 26 June 1989 (26.06.89) US</p> <p>(60) Parent Applications or Grants (63) Related by Continuation</p> <table> <tr> <td>US</td> <td>289,369 (CIP)</td> </tr> <tr> <td>Filed on</td> <td>23 December 1988 (23.12.88)</td> </tr> <tr> <td>US</td> <td>371,054 (CIP)</td> </tr> <tr> <td>Filed on</td> <td>26 June 1989 (26.06.89)</td> </tr> </table> <p>(71)(72) Applicants and Inventors: YUEN, Henry, C. [US/US]; 725 Lakewood Place, Pasadena, CA 91106 (US). KWOH, Daniel, S. [US/US]; 5029 Fox Point Lane, Rolling Hills Estates, CA 91106 (US).</p>		US	289,369 (CIP)	Filed on	23 December 1988 (23.12.88)	US	371,054 (CIP)	Filed on	26 June 1989 (26.06.89)	<p>(74) Agent: TOWER, Lee, W.; 19 Saddle Road, Rancho Palos Verdes, CA 90274 (US).</p> <p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published With international search report. With amended claims and statement.</p> <p>Date of publication of the amended claims and statement: 23 August 1990 (23.08.90)</p>	
US	289,369 (CIP)										
Filed on	23 December 1988 (23.12.88)										
US	371,054 (CIP)										
Filed on	26 June 1989 (26.06.89)										
<p>(54) Title: APPARATUS AND METHOD FOR USING ENCODED VIDEO RECORDER/PLAYER TIMER PREPROGRAMMING INFORMATION</p> <p>(57) Abstract</p> <p>Encoded video recorder/player timer preprogramming information (212) listed in a television guide (200) allows a timer preprogramming feature on a video cassette recorder (VCR) (14) to be programmed using a compressed code (102, 158, 212) of only 1 to as few as 7 digits, which are decoded by a decoder (38) built into either the video cassette recorder or a remote controller (82) to convert the compressed code into channel, date, time and length (118, 142) information. The channel, date, time and length information is communicated to a VCR and used to automatically activate the VCR to record a given television program with the corresponding channel, date, time and length. Alternately, the channel, date, time and length information is decoded directly in a remote controller (80) and only start record, stop record and channel selection commands are sent to the VCR (70) at the appropriate times. The compressed codes (212) associated with each television program can be printed in a television program guide (200) in advance and used with a VCR or remote controller with the decoding means. The compressed codes for timer preprogramming can be utilized for just one program or repeatedly for daily or weekly use. The algorithm (100) for decoding the compressed codes can be a function of time (120, 42, 122) to ensure security of the decoding method. A method is included for use of the compressed codes with cable channels (176, 160, 162, 166) and a method and apparatus is described for timer preprogramming for a large number of programs (76). The coding technique can also be used for compressed coding of any multidimensional vector for commercial or industrial applications.</p>											

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Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
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BG	Bulgaria	HU	Hungary	NO	Norway
BJ	Benin	IT	Italy	RO	Romania
BR	Brazil	JP	Japan	SD	Sudan
CA	Canada	KP	Democratic People's Republic of Korea	SE	Sweden
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